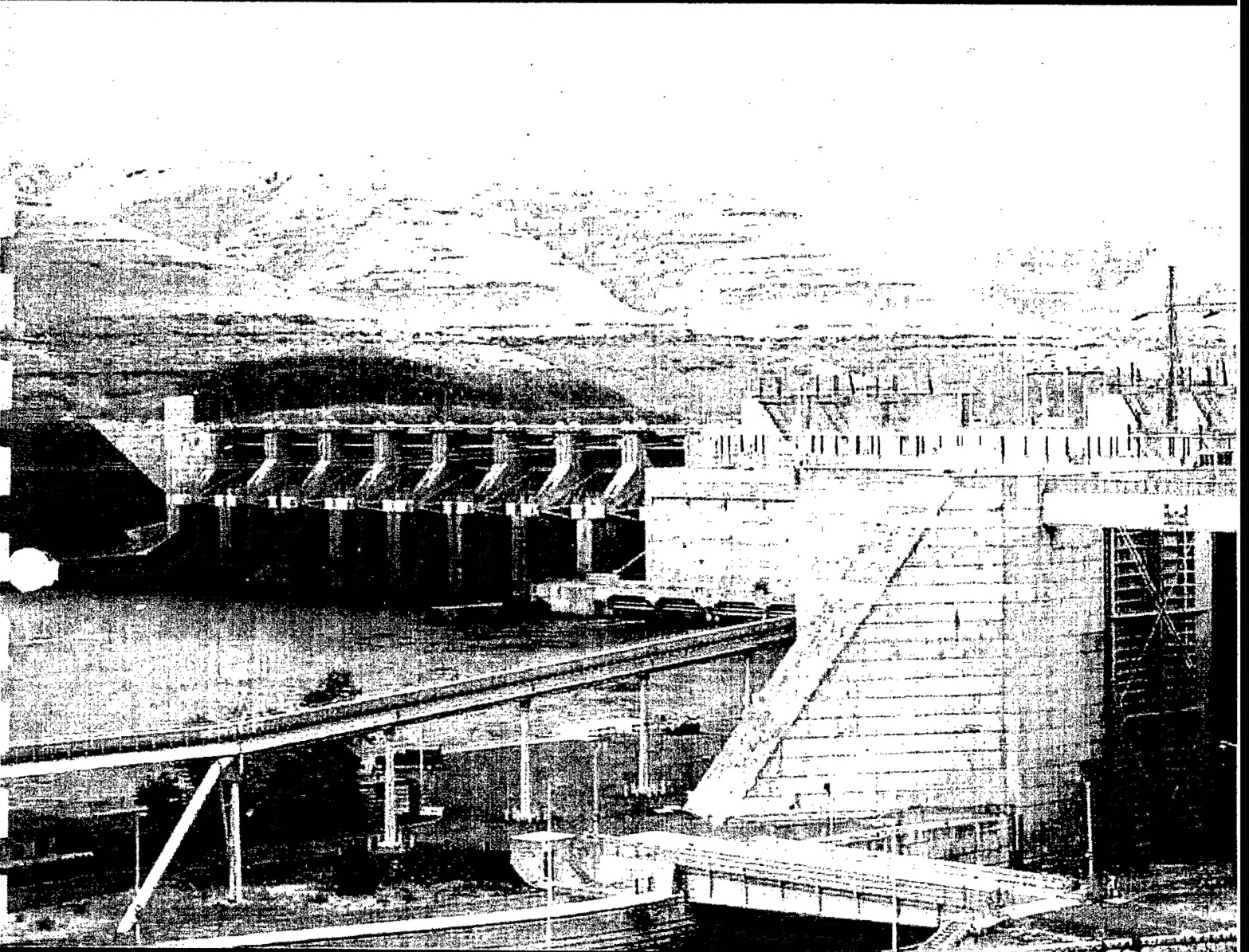


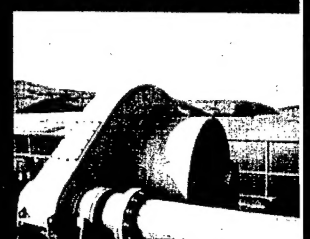
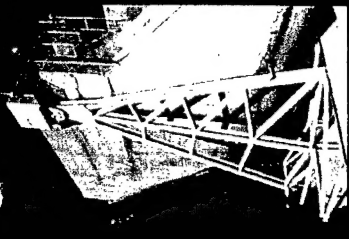
February 2001

# *Little Goose Dam*

## *Radial Gate Inspection and Testing*



US Army Corps of Engineers, Walla Walla District



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# LITTLE GOOSE DAM

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# **LITTLE GOOSE DAM RADIAL GATE INSPECTION AND TESTING**

## **INTRODUCTION**

### **Purpose**

The Corps of Engineers, Walla Walla District, requires a comprehensive evaluation of the radial gates at Little Goose Dam. The District retained HDR Engineering, Inc. to perform inspection and testing of the radial gates through Task Order No. 5 under Contract DACW68-00-D-0001. The task order scope of work includes review of project information, an initial meeting and inspection, comprehensive field inspection of the radial gates, testing of gate hoist machinery, recording trunnion movement, and preparation of a report.

### **Scope of Investigation**

The scope of this investigation includes:

- Review of design, construction, maintenance and operations information provided by the District.
- Hands-on visual inspection of accessible upstream and downstream portions of eight radial gates.
- Visual inspection of the hoists and hoist equipment.
- Testing of gates and hoists while operating.
- Recording trunnion movements while raising gates in both loaded and unloaded condition.
- A report including documentation of the design and operation of the gates and hoists, inspection and testing results, conclusions, and recommendations.

### **Limitations**

The services under this contract include the professional opinion and judgment on the data and information reviewed. The conclusions and recommendations presented in this report are based on the information provided by the District and the inspection of the radial gates and hoists. The inspection was visual only and only accessible portions of the components were inspected. No nondestructive tests or laboratory testing was conducted in the course of the inspection.

## **PROJECT BACKGROUND**

### **Project Description**

Little Goose Dam is located in southeastern Washington on the Snake River, 28.7 river miles upstream of Lower Monumental Dam, and 70.3 miles above its confluence with the Columbia River.

The main project structures include a powerhouse, concrete spillway, navigation lock, fish facilities, concrete non-overflow sections, and a rockfill embankment on the north shore. The dam is 2,655 feet long including the embankment. Construction of the project began in June 1963 and was completed in January 1970.

The spillway is 512-feet-long and is located about mid-river. The spillway consists of eight radial gate controlled bays separated by 14-feet-wide piers. The radial gates are each 50-feet wide by 60-feet high. The gates are numbered 1 to 8 from left to right looking downstream. The spillway structure has a maximum height of 204.4 feet with the deck at Elev. 651.0. The spillway crest is at Elev. 581.0 and the top of gates at Elev. 640.0. The reservoir stores 565,000 acre-feet at normal full pool (Elev. 638.0).

The Spillway Design Flood (SDF) is 850,000 cfs. The spillway has a design capacity of 850,000 cfs at reservoir level Elev. 646.5. The maximum spillway capacity at normal full pool (Elev. 638.0) is 676,000 cfs. At Little Goose Lock and Dam for the period from 1951 to 2000 the maximum flood of record was 306,700 cfs on June 18<sup>th</sup>, 1974. Peak flow outside the period of record is 409,000 cfs on June 5<sup>th</sup> 1894. This value was computed from flood marks by the U.S. Weather Bureau.

### **Gate Design and Construction**

The Corps of Engineers designed the gates and project facilities. The gates were fabricated by Pacific Car and Foundry of Seattle, Washington.

The Walla Walla District provided copies of the engineering drawings and shop drawings for the gates. The gate and hoist specifications were also provided as well as design calculations for the gates. The following information was obtained from these documents.

The 3/8-inch to 1/2-inch thick skin plate is supported by vertical ST10WF31 purlins. The skin plate is 3/4-inch thick on each end of the gate to act as a wear surface for the lifting cables. The purlins are connected to three horizontal plate girders. Each horizontal girder is supported by 14WF gate arms. The gate arms are braced with 14 WF members and there are ST7WF15 braces between the downstream flanges of the horizontal girders. The gate end frames were assembled in

## **LITTLE GOOSE DAM**

the field. The skin plate was installed in five vertical sections and joined by full penetration welds.

Cable attachment brackets are mounted on the skin plate at the bottom corners. The skin plate, purlins, horizontal girders and cable attachment brackets are A441 high strength / low alloy steel (Carbon - Magnesium - Vanadium, Heat Treated for Pressure Vessels). All other members are A-36 steel.

Each trunnion has a 24-inch diameter forged steel pin with a cast aluminum bronze bushing. The trunnion pin was designed to limit the bearing pressure to 4 ksi based on the reaction from the gate of 3,005 kips.

The trunnions rest on a concrete girder that is anchored to the spillway piers with two groups of 48 - 1-1/4 inch diameter prestressed bars. The trunnion girder and anchor bars were designed for two loading conditions: balanced and unbalanced. In the balanced condition with two adjacent gates closed, the total load on each group of anchor bars is 3,040 kips. When one gate is unloaded, the load on the anchor bars increases to 4,180 kips. The bars were designed for 0.6 of ultimate and a total prestress force of 5,122 kips.

The gates are raised and lowered by electric hoist units mounted on the deck above the gates. Eight, 1-inch diameter wire ropes on each side of the gate wind on separate drums mounted on a common shaft. The hoist operating speed is approximately 1.16 feet per minute.

The gates have rubber J-bulb side seals and rubber wedge bottom seals. The side seal plates and sill beams are heated to prevent ice formation. The heating system consists of piping embedded below the seal plates through which electrically heated oil is circulated. The seal heaters are manually started and thermostatically controlled when the air temperature drops to 32 degrees F. There are also air bubblers at three elevations on each pier for ice and debris clearing. They are manually operated from the service gallery.

A trunnion friction coefficient of 0.3 was used to design the yoke anchorage but there is no indication that trunnion friction was considered in the design of the gate arms.

### **Gate Operation**

The gates may be operated by manual control from stations located near each hoist, but normally the gates are remotely controlled from the powerhouse. All of the hoists can be powered from a diesel generator set.

The spillway is operated to pass the desired discharge with the best hydraulic conditions in the stilling basin. The gates are opened in one-foot increments during the fish passage season from March 1 through December 31 according to the operating sequence in Table 1.



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Gate Number / Gate Stops								Total	Spill
1	2	3	4	5	6	7	8	Stops	(kcfs) <sup>1</sup>

(1) Forebay El. 638

1	0	0	0	0	0	0	1	2	4
1	1	0	0	0	0	1	1	4	8
1	1	1	0	0	1	1	1	6	11
1	1	1	1	1	1	1	1	8	15
1	1	2	1	1	2	1	1	10	19
1	1	2	2	2	2	1	2	13	25
2	1	2	2	2	2	1	2	14	27
2	2	2	2	2	2	2	2	16	31
3	2	2	2	2	2	2	2	17	33
3	2	3	3	2	2	2	3	20	39
3	3	3	3	2	3	2	3	22	43
3	3	3	3	2	3	3	4	24	47
3	3	3	4	3	3	3	4	26	52
4	3	4	4	3	3	3	4	28	56
4	4	4	4	3	3	4	4	30	60
5	5	4	4	3	3	4	4	32	64
5	5	5	4	4	3	4	4	34	68
5	5	5	4	4	4	4	5	36	72
5	6	5	5	4	4	4	5	38	76
5	6	5	5	4	4	5	6	40	80
6	6	5	5	4	5	5	6	42	84
6	6	5	5	5	5	6	6	44	88
7	6	5	5	5	5	6	7	46	92
7	6	5	6	6	5	6	7	48	96
7	6	6	6	6	6	6	7	50	100
7	6	6	7	7	6	6	7	52	104
7	7	6	7	7	7	6	7	54	108
7	7	7	7	7	7	7	7	56	112
8	7	7	7	7	7	7	8	58	116
8	7	8	7	8	7	7	8	60	120
8	7	8	8	8	8	7	8	62	124
8	8	8	8	8	8	8	8	64	128
9	8	8	8	8	8	8	9	66	132
9	8	9	8	9	8	8	9	68	136
9	8	9	9	9	9	8	9	70	140

**Table 1 - Gate Operating Sequence**

## **Gate Maintenance**

The District performs routinely inspects, tests, and lubricates the gates and hoists. Recent significant maintenance activities consist of:

- Gate 1 – In August 1981, placed stoplogs and repaired hoist cable grooves in face plate with Belzona. Gate was sandblasted and painted. Also repaired hoist cable anchors by welding with stainless steel wire. Two 2-inch-diameter by 24-inch-long anodes were installed adjacent to each anchor block. These repairs were inspected in October 1987 and found to be in good condition.
- Gate 5 – Took gate out of service in June 1980 and inspected cables and anchors. Sandblasted damaged areas, repaired by welding, and painted with vinyl system. Inspected repairs in February 1988. South side of gate had severe corrosion under one wire rope with pits up to ¼ inch deep.
- Gate 8 – In September 1982 placed stops and repaired cable anchors by welding. Installed magnesium anodes adjacent to each block. Repaired corrosion under the cable with Devcon "A". Sandblasted and painted gate with standard vinyl system. Inspected in May 1992 and found that the repairs were in good condition. The anodes appeared to be preventing corrosion under the wire ropes. The south side shows more corrosion and the wear plates have small pinholes over the full length. The worst corrosion is occurring where the side seals connect to the gate face. The bolts are stainless steel. The center portion of the gate is showing pinhole corrosion.
- In 1983 all gates were reconditioned and repainted under contract DACW68-83-C-0111.

## **Inspection**

### **General**

Wayne Edwards and Mike Haynes of HDR Engineering performed an initial site visit and inspection on April 5, 2000. Based on information collected during the initial inspection, HDR prepared an inspection plan and inspection sheets that were submitted to the District for review prior to the detailed inspection.

The inspection and testing of the spillway radial gates was performed from October 2nd through 9th, by Sam Planck, P.E., Heather Yee and Tony Barela, of HDR Engineering, Inc. Steve Schmidtkofer and Jim Knowles of K&N Electric inspected the hoists, took amperage measurements, and recorded observations during testing. Gary Struthers Associates were responsible for operation of the gates during the loaded and unloaded testing and moved the stoplogs between gate testing. Emerald Services, Inc., as a sub-contractor to Gary Struthers, provided water blast cleaning of the skin plate during the upstream face inspection. The weather was clear with temperatures ranging from 50 to 75 degrees F for the inspection of Gates 2

# **LITTLE GOOSE DAM**

through 8. The upstream inspection of Gate 1 was performed in rainy conditions and a temperature of 40 to 50 degrees. Due to the wet and unsafe conditions, the racking measurements, inspection of the bottom of the upstream face and the trunnion dial gage measurements were not performed. Sam Planck, P.E. Amy Akins and Marv Brammer, P.E. of HDR returned to the site on November 20<sup>th</sup> to complete the inspections for Gate 1. The reservoir was full during all of the inspections.

## **Procedures**

### **Upstream Inspection & Testing**

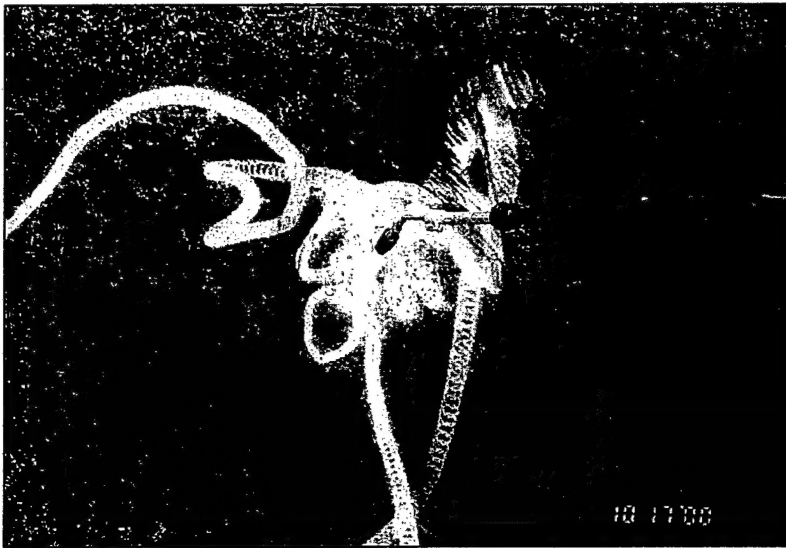
For the upstream inspections, stoplogs were placed in front of the gates prior to the inspection. The upstream face of Gates 1 through 8 were inspected from the spillway deck as each gate was raised to the full open position. The first part of the inspection was a rope access inspection of the bottom seal, bottom of the upstream surface of the skin plate and the hoist connections. At certain gates, the inspection under the bottom of the gate could not be made due to excessive leakage through the stoplogs, see Photo. 1. Racking measurements between the bottom seal and the spillway were also made at this time.



***Photo. 1: Heavy leakage from stoplogs preventing inspection of bottom upstream face of Gate 3.***

The second part of the upstream inspection consisted of the transverse, operational measurements at the trunnion, amperage readings while opening and closing the gate, and the inspection of the upstream surface of the skin plate. Measurements were made to determine transverse movement of the trunnion hub versus the trunnion yoke at the initial, full open, and final closed position. During the gate opening, visible corrosion, debris and surface inconsistencies were waterblasted from the gate face for better condition assessment, see Photo 2. Amperage readings for the hoist were recorded at initial opening, during opening and during closing.

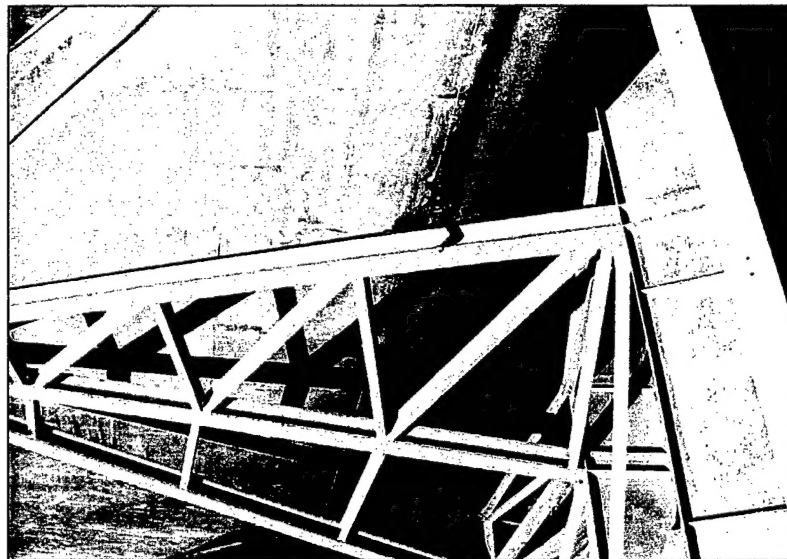
## LITTLE GOOSE DAM



**Photo. 2:**  
*Waterblasting  
of upstream  
surface of skin  
plate during  
full opening of  
gate.*

### **Downstream Inspection**

The downstream portions of all gates were inspected by climbing along the horizontal girders and radial struts, see Photo. 3. Inspection rigging for the downstream inspections was anchored to the gate hoist equipment and torque tubes. Visual observations were made for excessive sweep and camber of the main struts and were recorded only if an abnormal condition was observed.



**Photo. 3:** *Rope access downstream inspection.*



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## **Operational Testing – Unloaded vs. Loaded**

At the completion of the upstream inspection, with the stoplogs in place and the gate unloaded, dial gages were set at the trunnion to measure the vertical and lateral movement of the trunnion hub versus the trunnion yoke. Steel rulers were used to measure the transverse movement of the trunnion hub versus the trunnion yoke. After initial readings were taken, the top stoplog was cracked open and the void was flooded, loading the gate. When the void between the stoplogs and the gate was completely full, final movement readings were taken. There was no gap present at the bearing between the trunnion yoke and the trunnion support beam, therefore, movement readings between the two surfaces were not made.

## **Operational Testing – Loaded**

With the stoplogs removed and the gate fully loaded, the gates were opened to two feet. Amperage reading for the hoists were recorded at the initial opening, during the opening of the gate and during closing.

## **Ultrasonic Testing**

Non-destructive, ultrasonic testing was not performed at Little Goose Dam. At Lower Granite Dam the locations of field weld splices were indicated on the plans and were ultrasonically tested during the inspection. There were no indications of field weld splices in primary members on the design or shop plans for Little Goose Dam and none were found in the field.

## **Nomenclature**

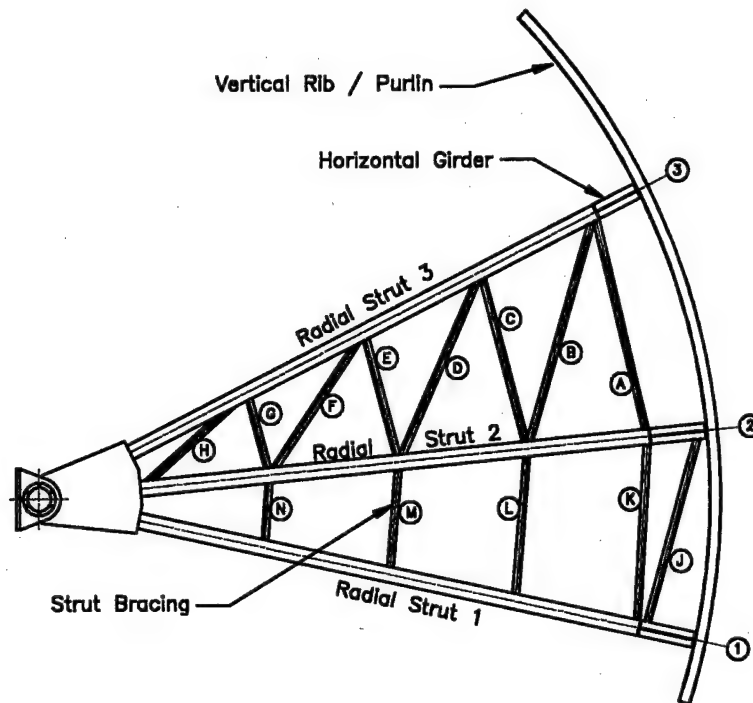
The gates are identified as Gate 1 to 8, with 1 on the south end near the powerhouse looking downstream. Unless noted otherwise, all locations of observations, and notes pertaining to the radial gates are identified as right or left looking downstream.

In the inspection sheets and this report, corrosion is classified as light, moderate or heavy as follows:

- Light - Surface rust with no flaking or packing. Rust can not be scraped off by hand.
- Moderate - Some flaking, beginning to pack, but thickness of the pack is less than approximately 1/16". There is no observable loss of section.
- Heavy - Pack rust with measurable or observable section loss to the member.

## Member Designations

For the radial gate inspection observations and the photographs, the member designations indicated in Figure 1 apply.



**Figure 1: Radial gate member designations.**

## General Inspection Observations

The majority of condition observations found during the inspection are consistently found at all of the gates. The following section of the report pertains to those general observations or conditions which were found to apply to all of the gates. Specific observations or deficiencies for individual gates begin on page 25. No significant deviations from the as-built plans were observed for the radial gates. Field inspection sheets for the gates are included in Appendix A. Hoist operation and inspection sheets can be found in Appendix B.

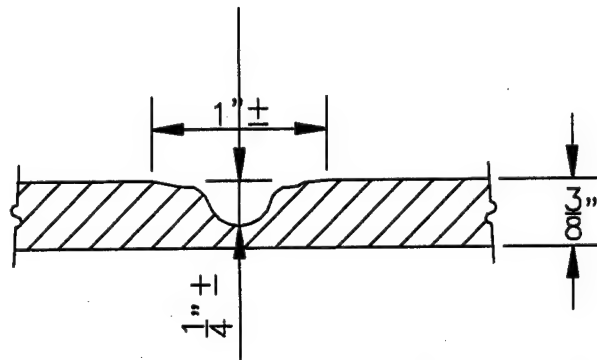
### Upstream Surface of Skin Plate

The condition of the upstream surface of the skin plate varies from generally good to extremely poor depending on the gate and the locations on the skin plate. On average, the pits are approximately one inch in diameter and 1/4-inch to 5/16-inch deep. Some appear to be greater than 1/4-inch deep in the 3/8-inch thick portion of the skin plate and greater than 3/8-inch deep in

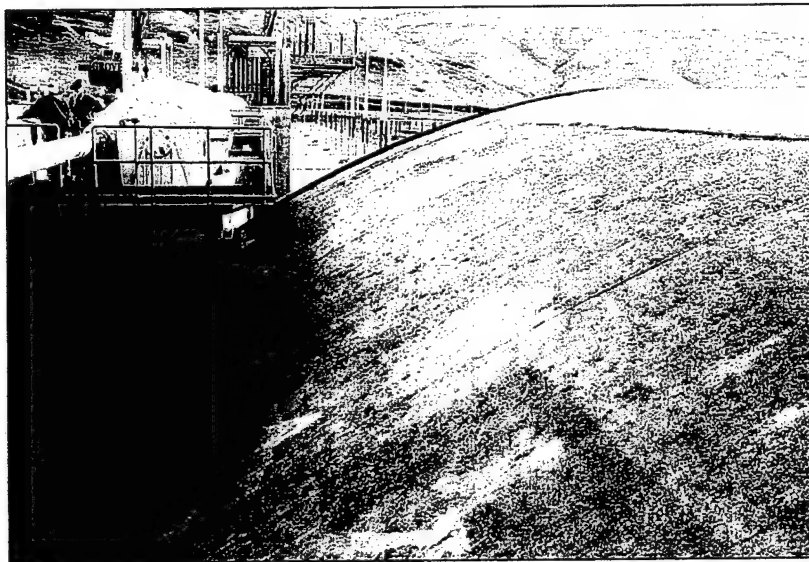
## LITTLE GOOSE DAM

the 1/2-inch thick portion. See Figure 2, and photos 4 and 5. There is moderate to heavy, scattered pitting on the 3/4-inch wear plates on most of the gates. There is pitting present in excess of 1/2-inch deep at some locations, see Photo. 6. At many locations the pitting on both the skin plate and wear plates appears to be associated with scratches or dings in the plates original protective coating, see Photo. 5 and Photo 7. Based on the hemispherical shape of the pitting, the corrosion appears to be microbially influenced. It is likely that increased acid levels due to microbial activity have created a concentration cell within the pits and accelerated the corrosion.

There is significant delamination of the vinyl coating on the wear plate at Gates 2 and 6 with smaller spots of delamination at other gates. See Photo. 8.



**Figure 2: Typical pitting profile in 3/8 inch plate.**



**Photo. 4: Typical, generally good condition of skin plate.**

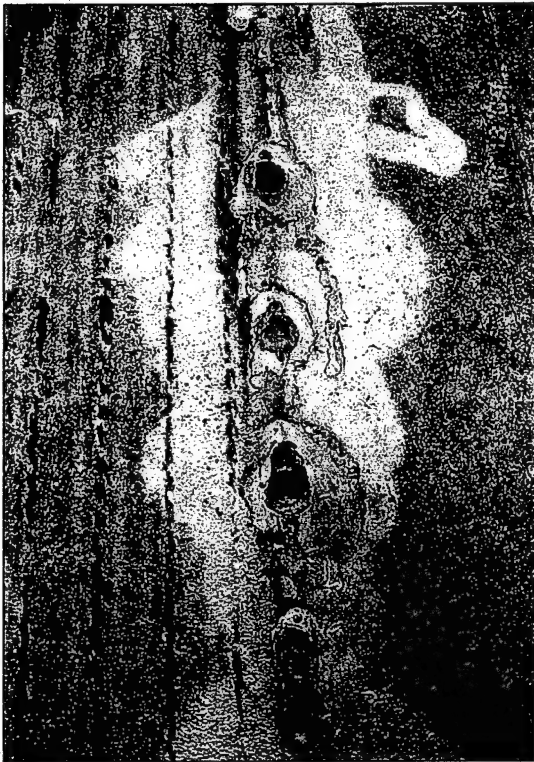


***Photo. 5: Skin plate pitting, typical.***



***Photo. 6: Wear plate pitting - heavy, typical. Hemispherical shape is indication of microbially influenced corrosion.***





**Photo. 7:** *Pitting on wear plate. Pitting appears to be associated with scratches in coating, typical.*



**Photo. 8:** *Delamination of vinyl coating on wear plate, typical Gates 2 and 6.*

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### **Hoists Connections**

The hoist connections are in generally good condition with light to moderate corrosion present on the lifting lug plates. The U-bolts, socket blocks and connection pin, which appear to be stainless steel, are in very good condition, see Photo. 9. The design or material type for the U-bolts, socket blocks and connection pin are not listed in the available plans. The sacrificial anodes appear to be in too good of a condition given their installation date of 1981 and 1982. It is likely that they were painted or in some way protected after their installation and ceased functioning as anodes.



***Photo. 9: Hoist connection, typical condition.***

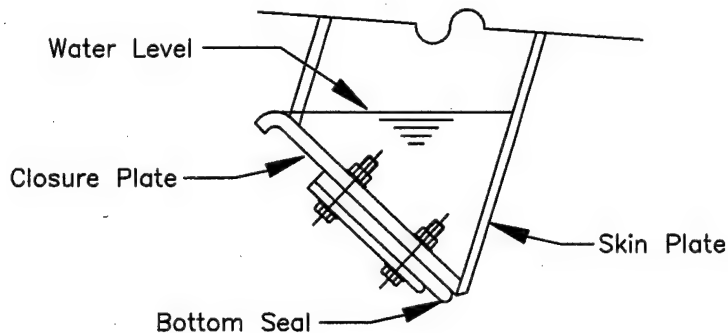
### **Downstream Surface of Skin Plate**

The downstream surface of the skin plate is in generally good condition. Isolated spots of light to moderate surface corrosion and previous (painted over) pitting can be found at various locations. There is also evidence of previous weld and grind repairs made to some gates indicating earlier penetration of the skin plate by corrosion. The weld and grind repairs are in good condition and show no signs of further corrosion from the downstream side. See Individual Gate Inspection Observations on Page 25 for locations and photographs of weld repairs.

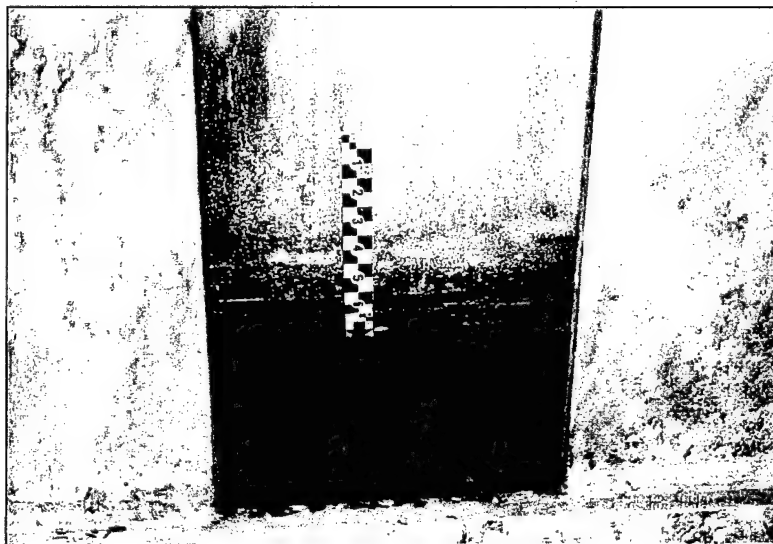
# **LITTLE GOOSE DAM**

## **Vertical Purlins**

The vertical purlins are in generally good condition. At the bottom of the gate there is standing water between the bottom seal closure plate, the web of the purlins and the downstream side of the skin plate. Light to moderate corrosion is forming on all surfaces. There is no drainage for this space and it is consistently full of water and debris at all gates, see Figure 3 and Photo. 10.



**Figure 3: Standing water at bottom of gate between skin plate, purlin webs and bottom seal closure plate, typical.**



**Photo. 10: Standing water at bottom of gate between skin plate, purlin webs and bottom seal closure plate, typical.**

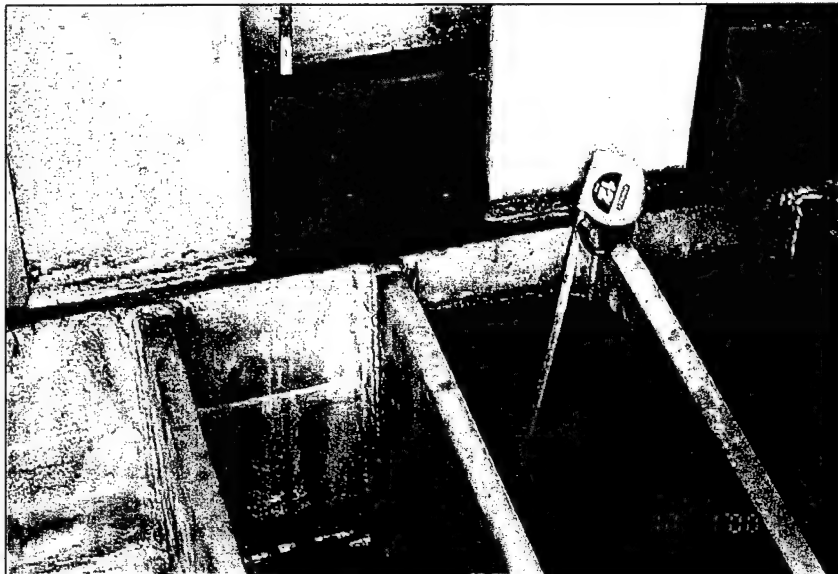
## **LITTLE GOOSE DAM**

### **Horizontal Girders and Braces**

The horizontal girders and bracing are in generally good condition. There are isolated spots of light to moderate corrosion, mostly at locations with poor drainage.

The top and middle horizontal girders are divided into twelve drainage areas due to the web stiffeners. The area at either end of the girders is free to drain off the end of the web. The remaining ten areas have only three drain holes and require water to flow horizontally through at least one notch in the stiffeners in order to reach a drain hole. There are debris lines and evidence of standing water on nearly all of the horizontal girder flanges and webs.

The worst corrosion occurs on the bottom horizontal girder, between the multiple stiffeners, at each end of the girder. There are six stiffeners in close proximity to one another with drainage only provided horizontally through a notch at the upstream (low) end of the stiffener. In order for the last space to drain, the water must travel horizontally under five stiffeners. These notches are typically clogged and the area between the stiffeners is consistently full of water and debris, see Photo. 11.



***Photo. 11: Standing water between stiffeners at ends of bottom horizontal girder, typical.***

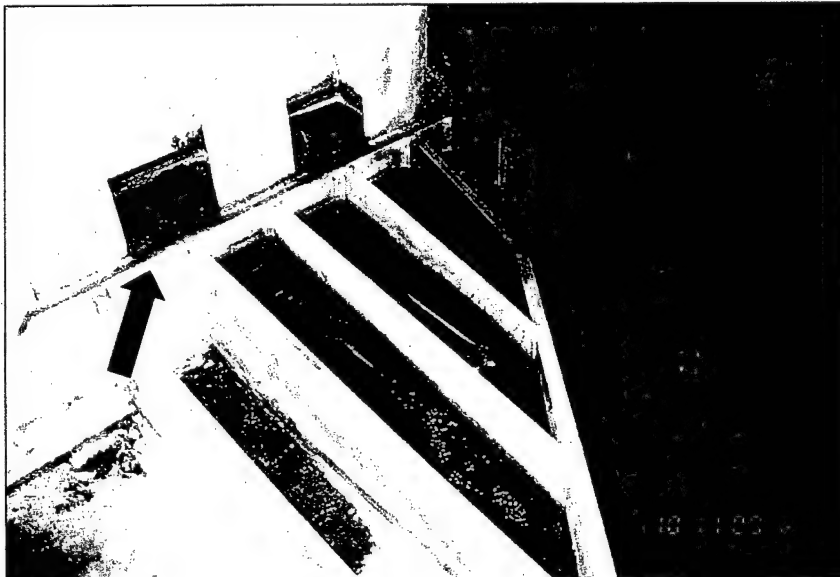


## LITTLE GOOSE DAM



**Photo. 12: Standing water or debris lines between stiffeners at ends of bottom horizontal girder, typical.**

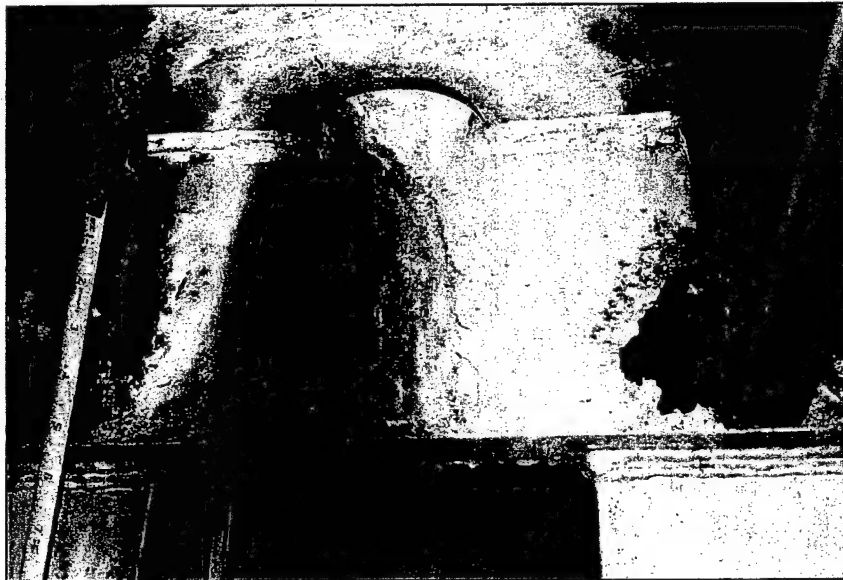
Immediately upstream and slightly above the end of the bottom horizontal girders, there are stiffeners between the skin plate, purlins and upstream flange of the horizontal girders. There is no drainage from this location and the enclosed area is either full of water and/or debris on all gates. See Photo. 13.



**Photo. 13: Standing water and debris between purlins, skin plate and upstream horizontal girder flange, typical.**

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On the underside of the bottom horizontal girder, at the connection to the radial struts, there is delaminated paint and light to moderate corrosion around the drain hole in the girder web and near the adjacent stiffeners. See Photo. 14.



**Photo. 14:** *Corrosion beneath bottom horizontal girder. Looking up at girder flange and drain hole. Stiffener at right, typical.*

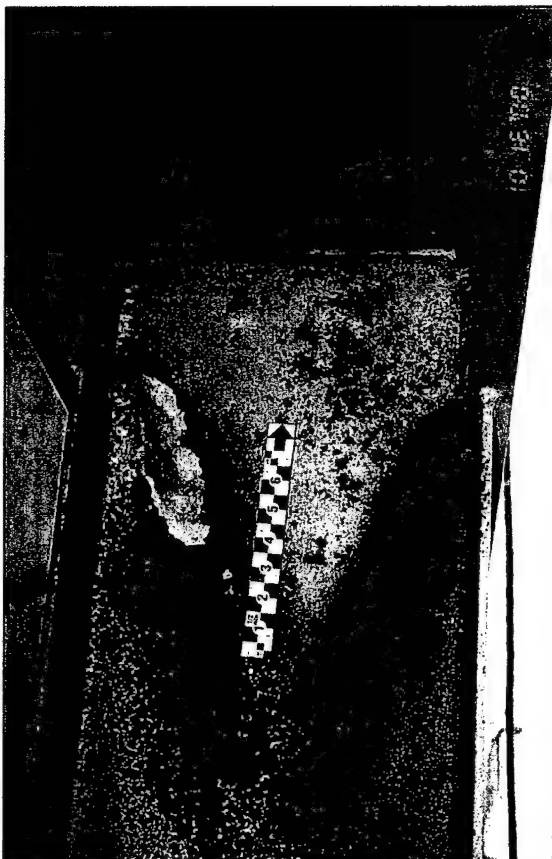
### Radial Struts and Braces

The radial struts are in generally good condition with only light surface corrosion at isolated locations, see Photo 15.

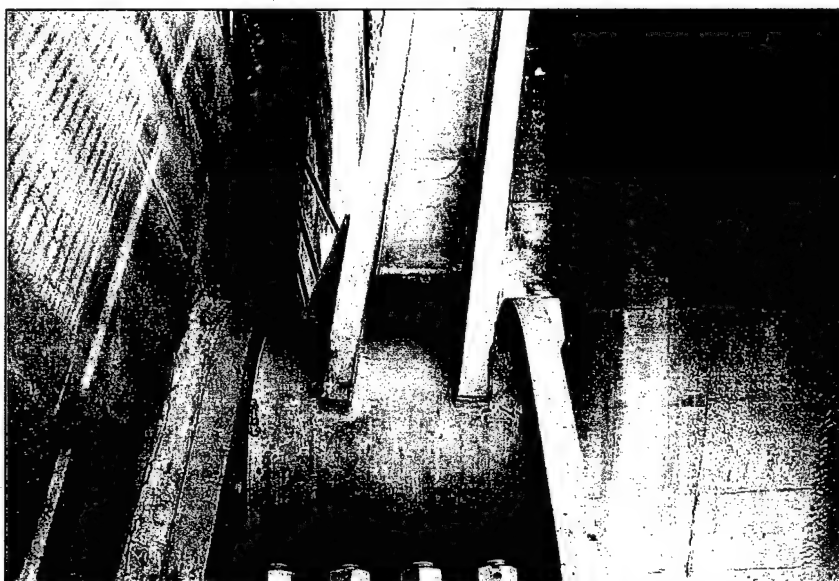
There is very poor drainage from the upstream end of the bottom radial strut and ponding or debris lines (evidence of previous ponding) are found at every gate.

There is very poor drainage from the downstream end of the top radial strut at the trunnion. The three radial struts become an enclosed box section at the trunnion. Since there is no drainage vertically from between the flanges of the top strut, a small drain hole is provided horizontally through the strut flange. The drain hole is consistently clogged and standing water is present at most trunnions. See Photo. 16.

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**Photo. 15: Light surface corrosion on radial struts and braces, typical.**



**Photo. 16: Standing water at downstream end of top radial strut at trunnion hub, typical.**

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## **Trunnions**

The trunnion hubs, yokes and bearing material are in generally very good condition and appear well lubricated. Lubricant was observed being expelled between the yoke and hub, around the circumference of all of the trunnions.

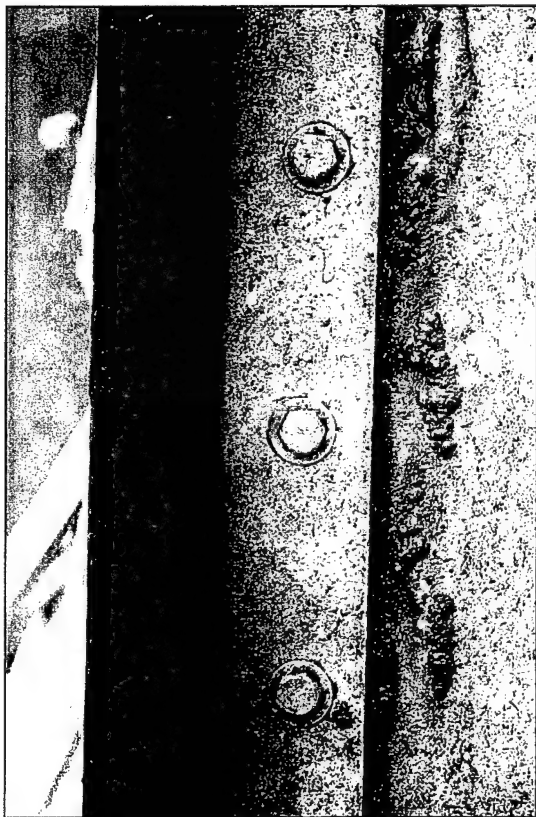
## **Side and Bottom Seals**

The side and bottom seals are in generally good condition. Small side and bottom seal leaks are visible on many of the gates, although no major leaks were observed. There is a leak at the bottom seal, at the spillway monolith construction joint at nearly every gate, see Photo. 17. There is light to moderate corrosion on the downstream side of the skin plate at the side seals and side seal bolts, see Photo 19.



***Photo. 17: Leak at spillway monolith construction joint, typical.***

## LITTLE GOOSE DAM



**Photo. 19: Side seal from upstream side with no signs of cracking or deterioration, typical condition.**



**Photo. 18: Side seal from downstream side, light to moderate corrosion on skin plate, seal angles, nuts and bolts, typical condition.**

There is moderate corrosion on the skin plate on the upstream side of the bottom seal. The downstream side of the bottom seal is in good condition with little occurrence of corrosion. See Photo. 20 and Photo. 21. The rubber seals are in good condition with only hairline cracking visible.

# **LITTLE GOOSE DAM**



***Photo. 20: Upstream side of bottom seal with light to moderate corrosion on skin plate, typical.***



***Photo. 21: Downstream side of bottom seal, typical***



## **Radial Gate – Operation, Testing and Measurements**

### **Member Section Dimensions**

Section dimensions of main structural members were measured to verify conformance with the design drawings. These members included radial struts, radial strut bracing, horizontal girders, horizontal girder bracing and purlins. Measured dimensions were recorded on field data sheets found in Appendix A. The data sheets also contain nominal section dimensions from the American Institute of Steel Construction (AISC) *Steel Construction Manual, Seventh Edition, 1970*. Section measurements typically include the depth,  $d$  (measured at the edges of the flanges), the flange width,  $b_f$ , and the flange thickness,  $t_f$ . Web thickness,  $t_w$ , was only measured if there was an exposed portion of the web or drain holes large enough for calipers.

Differences between the design drawings and the actual field conditions of  $1/16^{\text{th}}$  inch or less were deemed to be insignificant. Nearly all members in the field were found to be greater or equal in dimension than what was required in the design drawings. The larger dimensions were probably due to inaccuracies of the field measurements resulting from difficult access or with the thickness of the paint on the members. Those that were smaller were all within the fabrication tolerances. Of those measurements that were out of fabrication tolerance range, none were consistently out of range to conclude that a member other than what was specified in the design drawings was used.

### **Racking Measurements**

Racking measurements for the gates were made at the beginning of the upstream inspection of the gates. Measurements were recorded for the distance between the bottom of the gate at the bottom corner of the bottom seal plate, and the embedded spillway sill plate. Measurements were made as far as possible to the left and right side of the gate depending on stoplog leakage and flow on the spillway. The gates were typically between two and four feet open when the measurements were made. The measurements for racking are as follows:

	<b>Left (inches)</b>	<b>Right (inches)</b>
<b>Gate 1</b>	39 – 1/2	39 – 1/2
<b>Gate 2</b>	39 – 1/2	39 – 1/2
<b>Gate 3</b>	42	42
<b>Gate 4</b>	Too much stoplog leakage to measure	
<b>Gate 5</b>	39 – 1/4	39
<b>Gate 6</b>	41	41
<b>Gate 7</b>	38 – 1/2	39
<b>Gate 8</b>	45	45

**Table 1: Gate racking  
measurements.**

## **LITTLE GOOSE DAM**

The gates were also observed at the moment of first opening to look for signs of water release beginning from one side of the gate or the other. In most cases, water release would begin at both sides of the gate simultaneously and move towards the middle of the gate at equal rates. Based on the recorded measurements and observations, there is no apparent racking of the gates.

### **Trunnion Hub Movement: Closed - Full Open - Closed**

With the stoplogs in place, measurements were made of the transverse gap between the trunnion hub and the trunnion yoke, at both sides of the trunnion, at both trunnions. The measurements were made with the gate at the initial opening, full open, and again when closed. The maximum transverse movement recorded between any two positions is as follows:

	Left Trunnion		Right Trunnion	
	Inside (inches)	Pier Side (inches)	Inside (inches)	Pier Side (inches)
Gate 1	1/32	1/32	0	0
Gate 2	0	1/32	0	1/32
Gate 3	0	0	0	0
Gate 4	0	1/32	0	1/32
Gate 5	1/32	1/32	0	0
Gate 6	0	0	1/32	1/32
Gate 7	1/32	2/32	1/32	1/32
Gate 8	1/32	2/32	1/32	0

***Table 2: Transverse trunnion hub movement through full opening and closing***

Based on the surface irregularities of the trunnion hub and the casting tolerances, the transverse measurements between the hub and the yoke can only be considered accurate to  $\pm 1/16$ -inch. The recorded measurements indicate there is no appreciable lateral movement of the trunnion hubs with respect to the trunnion yoke during either opening or closing of the gate.

**Trunnion Hub Movement: Unloaded vs. Loaded**

Dial gages were installed at both trunnion to record the vertical, transverse and upstream / downstream movement of the trunnion hub with respect to the trunnion yoke. The initial measurement was made with the stoplogs in place and no load on the gate. The final reading was made after the top stoplog was removed and the gate was fully loaded. The maximum movements recorded at the trunnion hubs are as follows:

	Vertical (1 / 1000 inch)	Upstream / Downstream (1 / 1000 inch)	Transverse (1 / 1000 inch)
Gate 1	7	34	0
Gate 2	4	22	0
Gate 3	12	31	31
Gate 4	8	32	0
Gate 5	10	31	31
Gate 6	0	45	0
Gate 7	11	37	31
Gate 8	1	30	0

**Table 3: Loaded versus unloaded trunnion movements**

For the vertical movements shown in Table 4, the hub moved upward with respect to the yoke during loading. The upstream / downstream movement of the hub was in the downstream direction and the transverse movement was outward, toward the piers.

The design tolerance for the 24-inch diameter trunnion pin is listed in the plans as +0.000 inches and -0.005 inches. The tolerances for the 24-inch diameter trunnion bushing is listed as +0.012 inches and -0.000 inches. The shop plans for the pin indicate the pin should be 23.98 inches in diameter with tolerances of +0.000 inches and -0.008 inches.

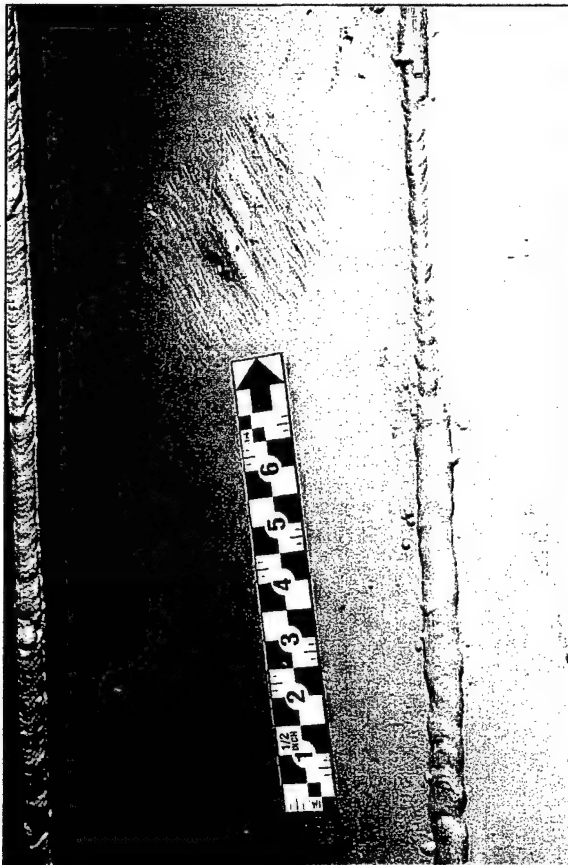
Based on the recorded movements and the tolerances, there is no significant displacements of the trunnion hub with respect to the trunnion yoke occurring during the loading process.

## Individual Gate Inspection Observations

The observations in the following section pertain only to the gates indicated and were not typically found on all of the gates.

### Gate 1

- There is an apparent weld and grind repair on the downstream side on the skin plate at approximately 5 feet above the middle horizontal girder near the left side of the gate.



**Photo. 22: Apparent previous weld and grind repair as seen from downstream side of skin plate on Gate 1.**

## **LITTLE GOOSE DAM**

### **Gate 2**

- On the downstream side of the skin plate, along the wear plate, there is delamination of the vinyl coating on the plate. Large sheets of vinyl are peeling off of the wear plate and hanging loosely on the gate face.



***Photo. 23: Delaminated  
vinyl coating  
on wear plate,  
right side of  
Gate 2.***

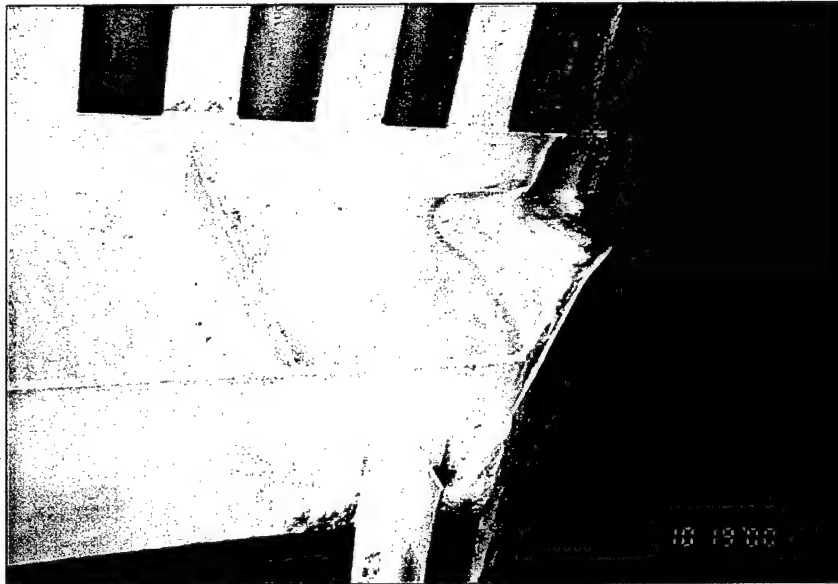
### **Gate 3**

- See General Inspection Observations

## LITTLE GOOSE DAM

### Gate 4

- There is a large deformation in the web of the top horizontal girder at the left end.



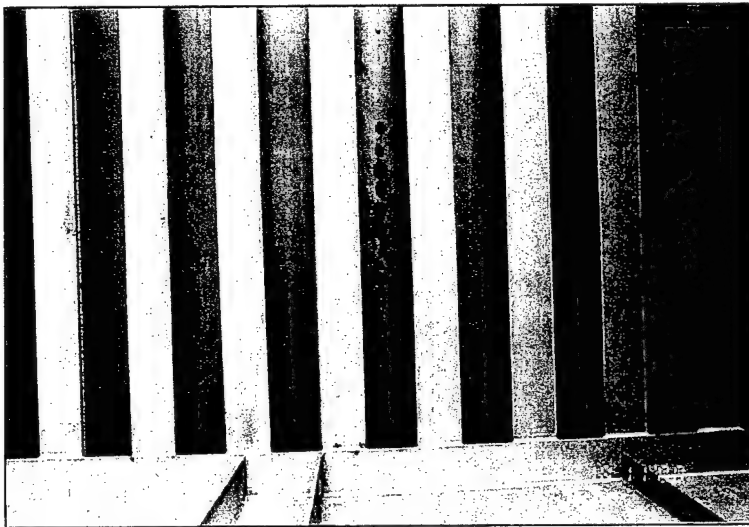
***Photo. 24: Deformation in web of top horizontal girder.***



## LITTLE GOOSE DAM

### Gate 5

- There is a line of light to moderate corrosion on the downstream side of the skin plate just above the top horizontal girder approximately 10 feet from the left side of the gate.



**Photo. 25: Moderate corrosion on downstream surface of skin plate.**

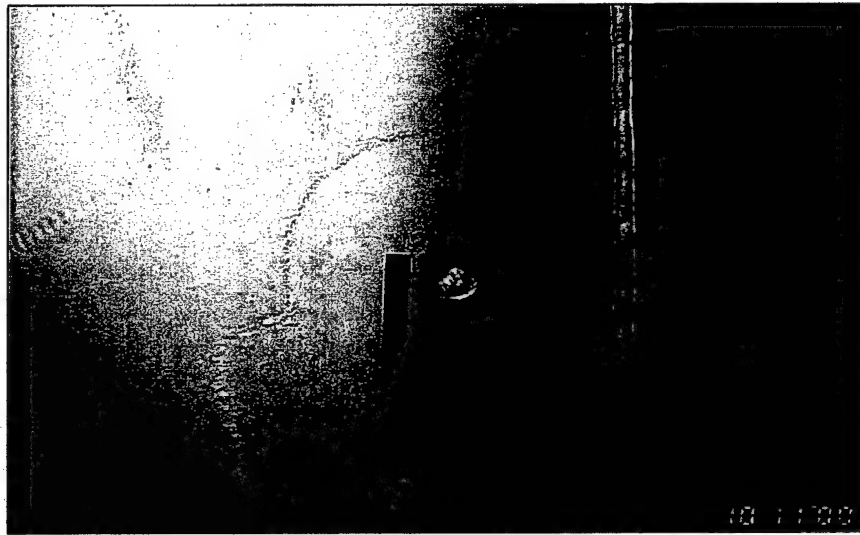


**Photo. 26: Moderate surface corrosion on downstream surface of skin plate.**

## **LITTLE GOOSE DAM**

### **Gate 6**

- On the downstream side of the skin plate at approximately half way between the middle and top horizontal girder, twelve feet from the left side, there is an apparent weld and grind repair from a previous leak. The plug weld is approximately ½-inch in diameter.



***Photo. 27: Apparent, previous weld and grind repair on downstream surface of skin plate.***

- On the downstream side of the skin plate, along the wear plate, there is delamination of the vinyl coating on the plate. Large sheets of vinyl are peeling off of the wear plate and hanging loosely on the gate face.



***Photo. 28: Delaminated vinyl coating on wear plate, left side of Gate 6.***

# **LITTLE GOOSE DAM**

## **Gate 7**

- See General Inspection Observations

## **Gate 8**

- See General Inspection Observations

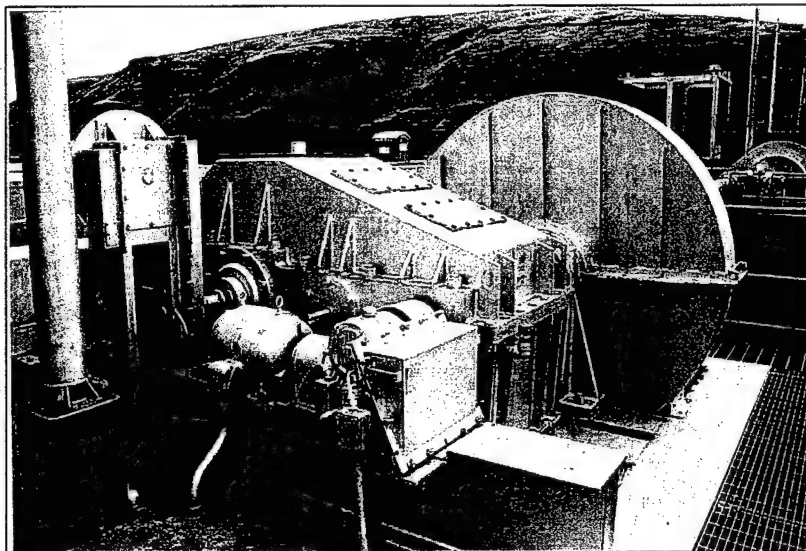
### **Hoists – Operation, Testing and Measurements**

#### **Hoist Operation Inspection**

External portions of the hoist equipment, support platforms and gate connections were visually inspected for signs of excessive corrosion, wear or damage. The hoist and hoist machinery are in generally good condition, however, excessive motor and bearing noises were observed at many of the hoists. See Photos 30, 31 and 32.

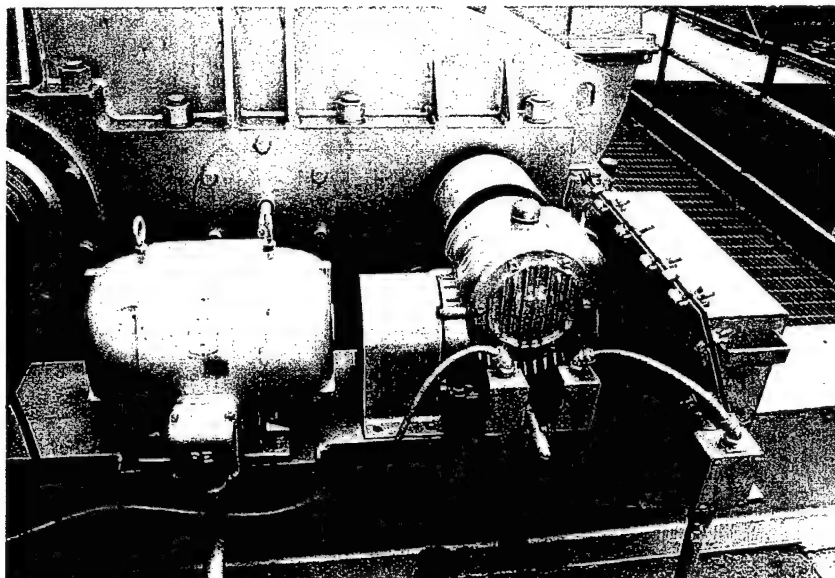


*Photo. 29: Recording hoist amperage readings.*



*Photo. 30: Gate hoist, typical.*

## LITTLE GOOSE DAM



**Photo. 31: Hoist motors, typical. Note fluid leaking from beneath motor.**



**Photo. 32: Hoist manufacture's plate.**

## LITTLE GOOSE DAM

The following observations were made at individual gate hoists:

	Hoist and Motor Observations
Gate 1	None
Gate 2	The motor bearings are noisy.
Gate 3	The motor lead wires and heater wires are frayed.
Gate 4	The motor bearings are noisy and sound dry.
Gate 5	None
Gate 6	The hoist brake seized during operation and was adjusted.
Gate 7	The motor bearings are in need of replacement.
Gate 8	None

**Table 4: Hoist operation observations.**

### Hoist Amperage Measurements:

Hoist amperage readings were recorded during opening and closing of the gates in both the loaded and unloaded condition. The readings include the start up and running amperage. Running amperages were recorded for Phase A, B and C. Table 5 lists the opening and closing start up amperage and the average of the three phases for the running amperage for the gates in the unloaded condition. Table 6 lists the same information for the loaded condition.

	Start up Opening	Start up Closing	Running Opening	Running Closing
Gate 1	87.6	72.0	10.8	6.5
Gate 2	92.8	81.6	10.8	6.6
Gate 3	96.0	85.6	10.9	6.2
Gate 4	94.4	84.0	11.3	5.5
Gate 5	84.8	78.0	11.6	6.2
Gate 6	99.2	80.0	13.4	6.5
Gate 7	102.0	80.0	11.7	6.1
Gate 8	84.0	74.0	12.1	6.3

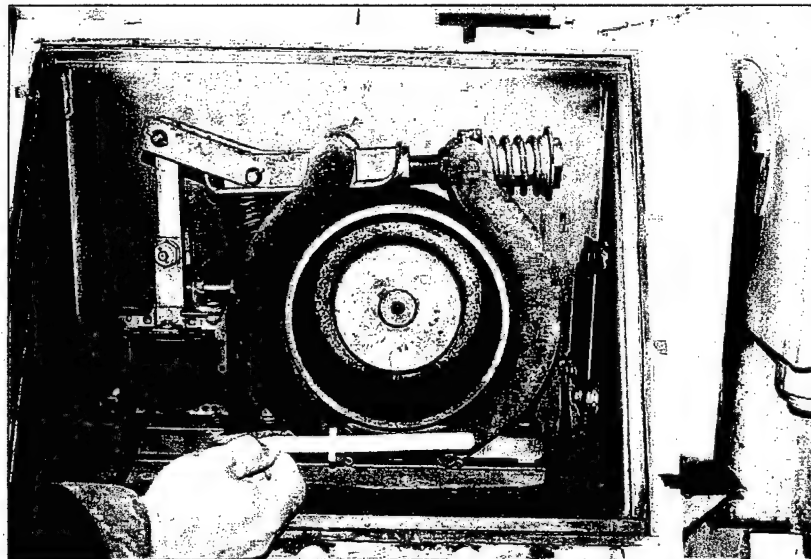
**Table 5: Unloaded Gate - Hoist Amperage Readings**

## LITTLE GOOSE DAM

	Start up Opening	Start up Closing	Running Opening	Running Closing
Gate 1	112.0	110.0	16.0	9.6
Gate 2	103.0	93.6	12.0	6.8
Gate 3	101.0	94.0	11.6	6.4
Gate 4	96.0	75.0	11.7	5.8
Gate 5	93.0	88.0	12.4	6.1
Gate 6	104.0	99.2	13.6	7.5
Gate 7	101.5	86.0	10.9	6.4
Gate 8	102.0	80.0	11.5	6.1

**Table 6: Loaded Gate - Hoist Amperage Readings**

Based on the consistency of the readings the hoists are in generally good condition. The amperage data indicates that the tainter gate hoist motors are operating well within their design operating limits that normally allow the starting amperage to be in the range of 5 to 8 times the nameplate value. The current draw for all motors were in acceptable range and the gates appeared to be free with no apparent binding. The motors on the hoists are all noisier than would be expected for these units. The motors all have sealed bearings with no lube ports. During the opening of Gate 6 the hoist motor break seized and adjustments to the break were made in order to continue operation, see Photo. 33. The field inspection sheets for the hoist measurements can be found in Appendix B.



**Photo. 33: Seized brake on Gate 6 hoist.**



## **RECOMMENDATIONS**

### **Recommended in the next year or as necessary:**

- Repair pitting on skin plate and repaint (or recoat) upstream surface of gate face.
- Install new sacrificial anodes on upstream side of gate. A corrosion expert should be consulted to determine the number and location of anodes required. Existing anodes may remain in place.

These repairs can be undertaken sequentially on all of the gates at once or the repairs could be made on an as-needed basis as the pitting penetrates the skin plate and leaks develop at individual gates.

### **Recommended in the next 2 years:**

- Analyze the hoist gearboxes per the manufactures recommendation and remanufacture or replace as required.
- Replace the main gearbox seals on the hoist motors.

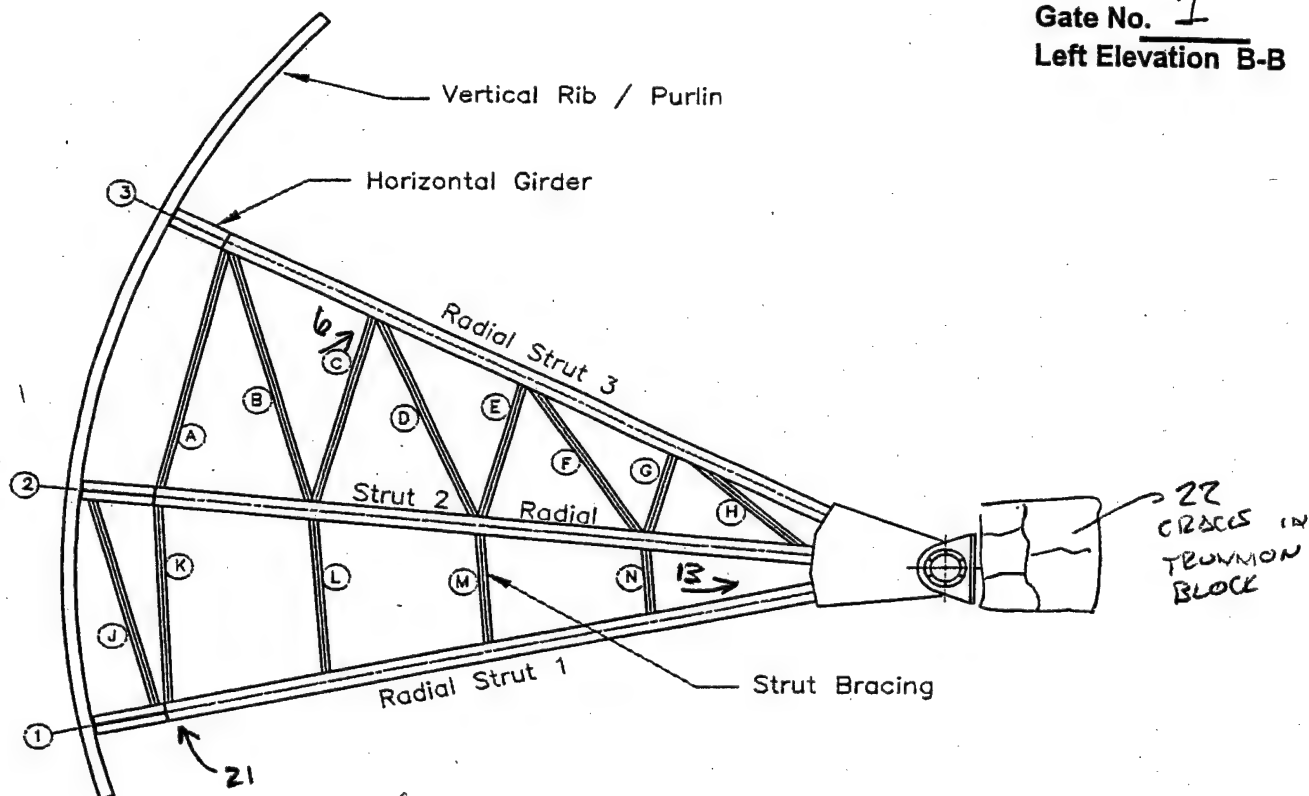
### **Recommended in the next 5 years:**

- Install drain hole between the multiple stiffeners at ends of the bottom horizontal girders. The recommended size for these drain holes is 1-inch in diameter.
- Install drain holes in the purlin stiffeners near the ends of the bottom horizontal girders (Plate perpendicular to skin plate, above multiple stiffeners on bottom horizontal girder). The recommended size for these drain holes is 1-inch in diameter.
- Install drain holes in the downstream portion of the bottom seal plate between every purlin. Note: the rubber bottom seal is located between the bottom seal plate and the bottom seal keeper plate. The hole should not be flame cut with the rubber bottom seal in place. The recommended size for these drain holes is 1-inch in diameter.
- Enlarge the drain holes at upstream end of lower radial struts. The recommended size for these drain holes is 1 1/2 - inch in diameter.
- For all new and enlarged drain holes, the holes should be drilled, not flame cut, to reduce jagged edges which snag debris. If drilling holes is not feasible, then the edges of the flame cut holes should be reamed smooth.

## **REFERENCES**

1. Water Control Manual, Little Goose Lock and Dam, U.S. Army Corps of Engineers, Walla Walla District, February 1988.

Gate No. 1  
Left Elevation B-B



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 3/4	15/16	5/16	15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16	5/16	16 3/8	16 3/8	2 7/16	2 1/2
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16	5/16	16 5/8	16 5/8	2 13/16	2 3/4
Brace A	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace D	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8

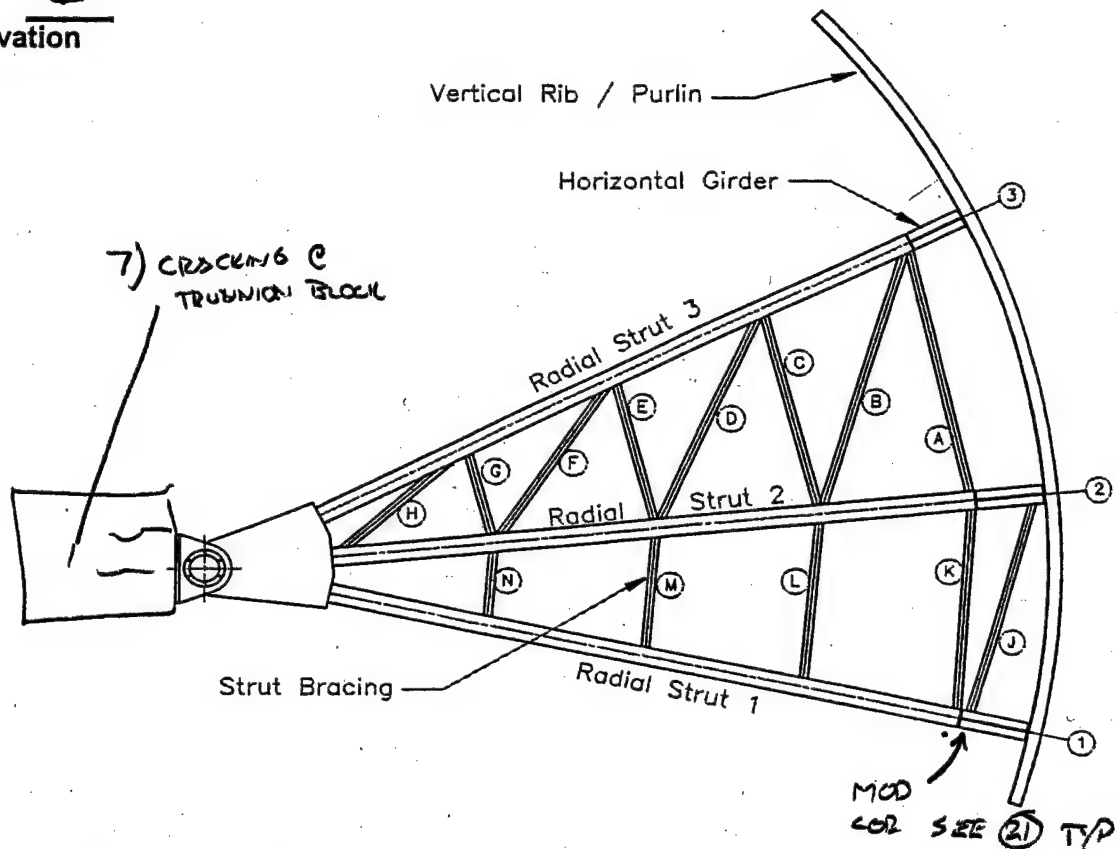
21) MOD COR-

HDR Engineering, Inc.  
Corp of Engineers - Walla Walla  
Little Goose Dam

Inspection Team SMP TDB HAY  
Weather \_\_\_\_\_

Date 10/16  
Sheet 2

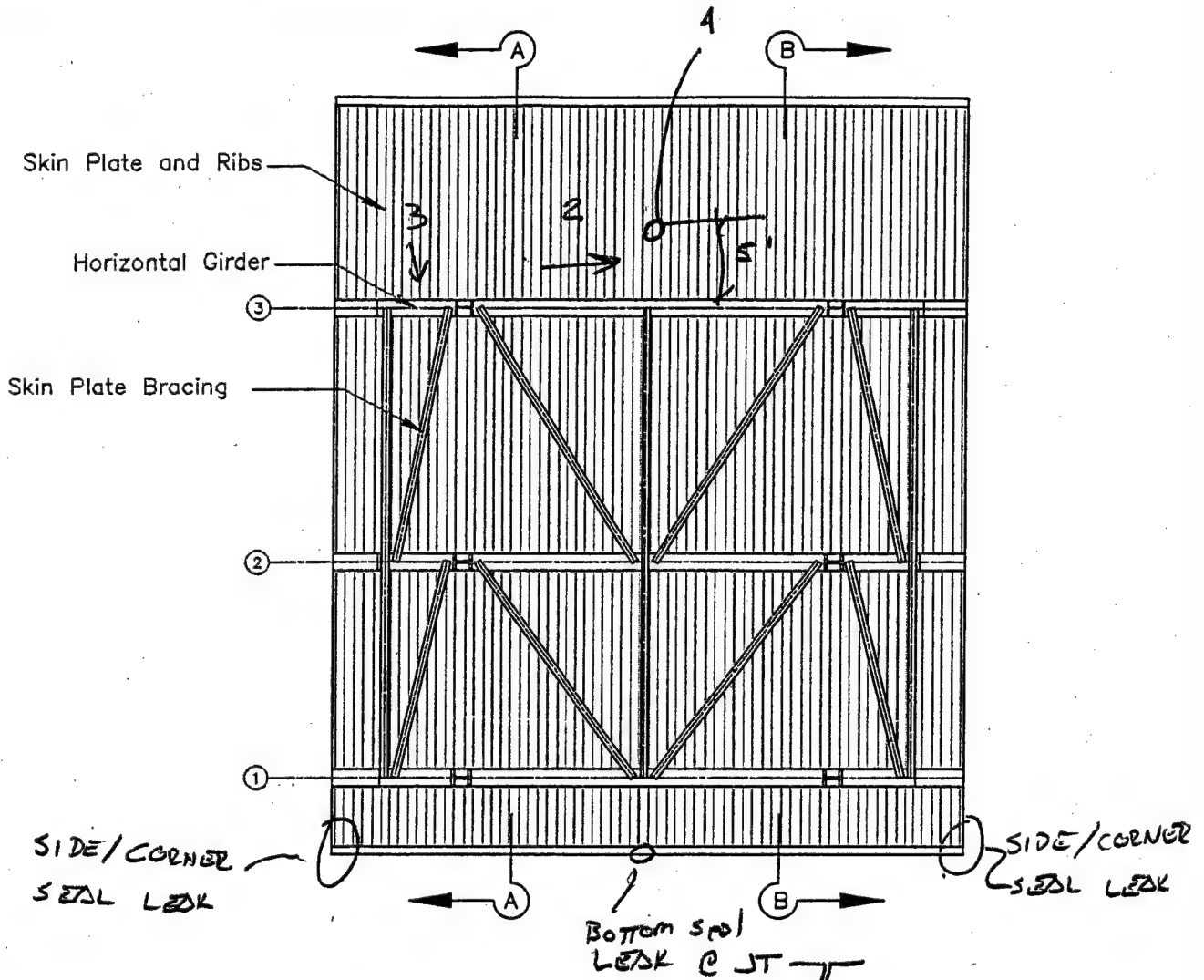
Gate No. 1  
Right Elevation  
A-A



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 5/8	15/16	—	15 3/4	5 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16	—	16 3/8	16 3/8	2 7/16	2 1/2
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16	1 15/16	16 5/8	16 3/8	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace D	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace F	14 WF 30	13 7/8	13 15/16	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6 3/4	3/8	3/8

LEFT FROME MORE COR THAN RIGHT

Gate No. 1 Downstream Elevation



Member	Type	Depth d		Web t <sub>w</sub>		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	49 7/8	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	60 1/2	3/4	13/16	16 1/2	16 1/2	1 1/4	1 5/16
Horiz. Girder 1	PL Girder	60 1/2	60 1/2	1	1	16 1/2	16 1/2	1 1/4	1 5/16
Purlins	ST 10 WF 31	10 1/2	10 1/2	13/32	—	8 1/4	8 1/4	5/8	5/8
Skin Plate Bracing	ST 7 WF 15	7	7 1/8	1/4	1/4	6 3/4	6 3/4	3/8	3/8

LIGHT SURFACE COR - EVIDENCE STANDING WATER

2) TYP TOP GIRDER

3) TYP LIGHT COR

4) POSSIBLE PREV. WELD & GRIND PATCH

Date \_\_\_\_\_  
Sheet 4

①

VERY CLEAN  
COMPARED TO  
OTHER GATES

Gate No. 1 Operation and Trunnion Measurements

Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
39 1/4	39 1/4

Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

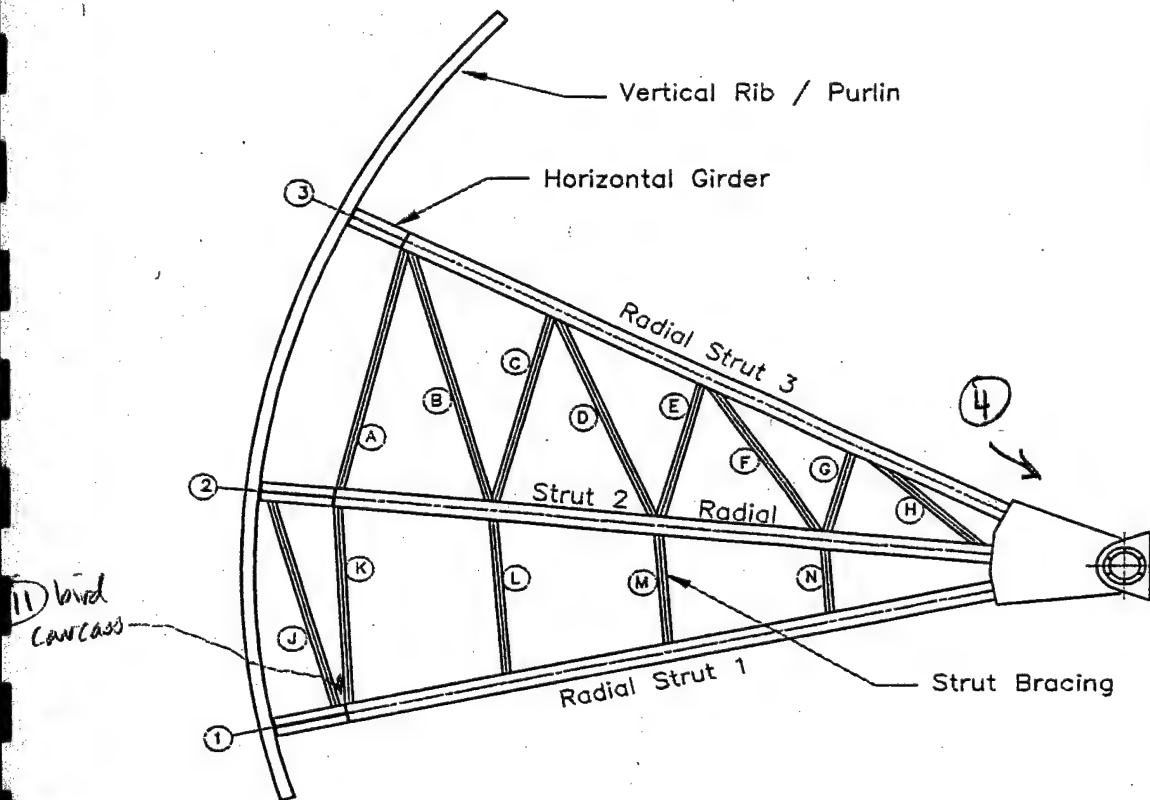
	LEFT		RIGHT	
	Inside	Outside (pier)	Inside	Outside (pier)
Initial Gate Closed	20/32	14/32	20/32	15/32
Gate Full Open	19/32	15/32	20/32	15/32
Final Gate Closed	20/32	14/32	20/32	15/32

3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	0.0000		-0.0065		0.0000		0.0000	
US / DS	0.0000		+0.0335		+0.0065		+0.0365	
Transverse	29/32	15/32	29/32	15/32	29/32	14/32	21/32	14/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside



Gate No. 2  
Left Elevation B-B

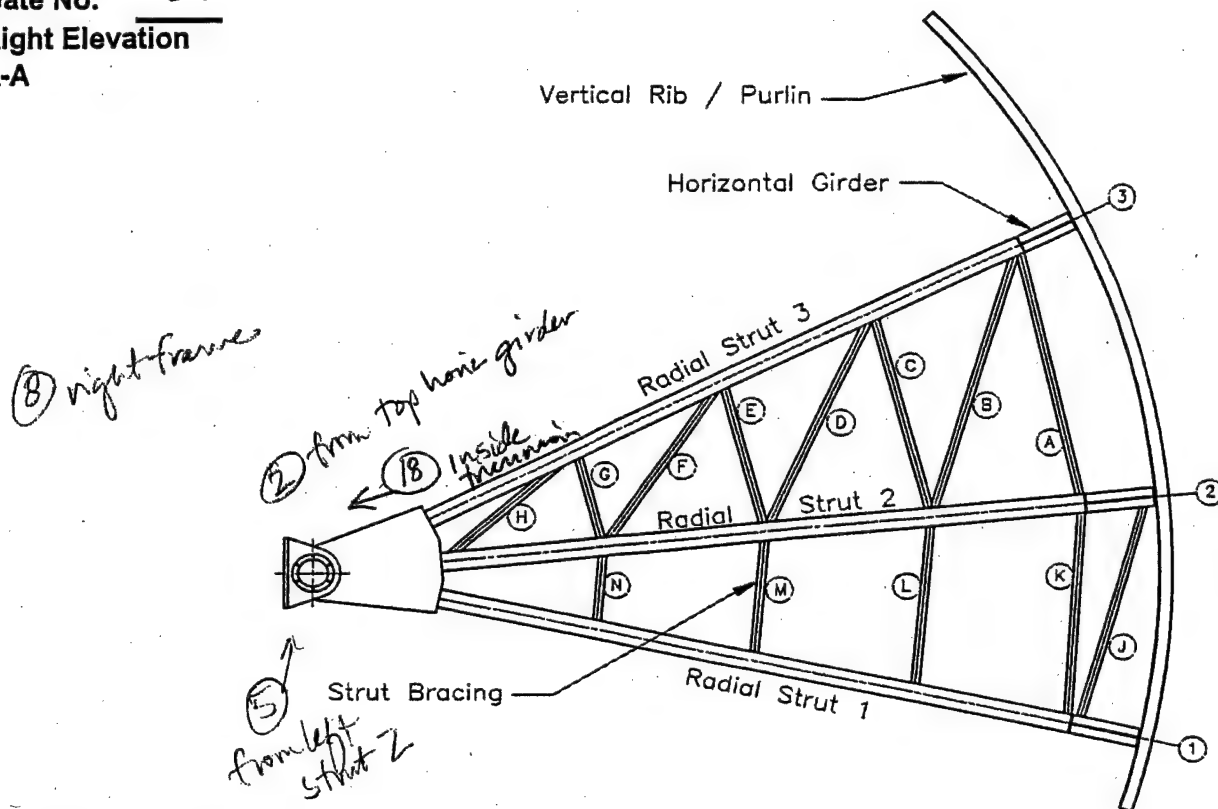


⑨ US side of brace N  
typical light  
surface rust

⑭ entire frame  
from bottom  
horiz

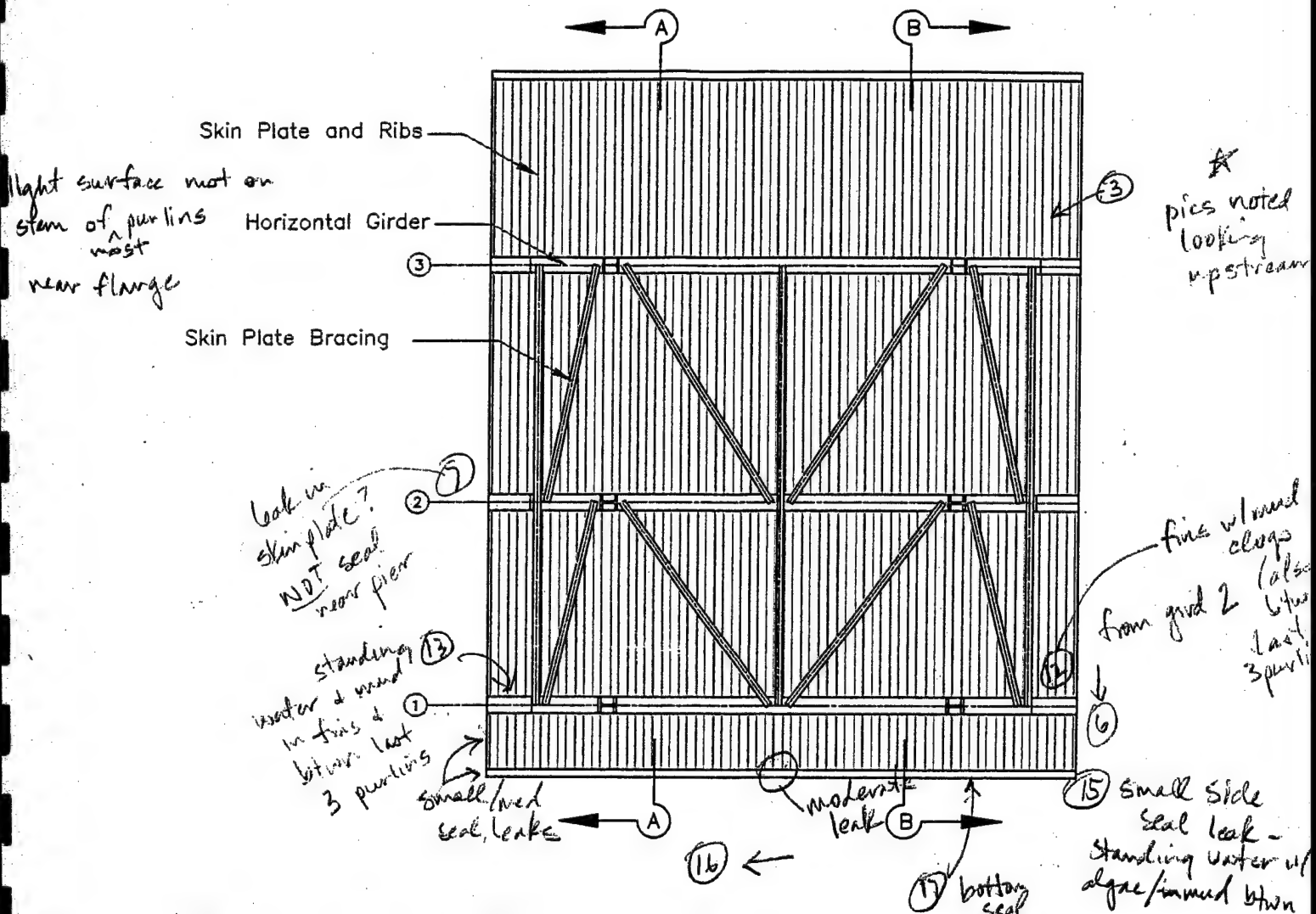
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 5/8	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 3/4	1 9/16		16 3/8	16 3/8	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 5/16	1 13/16	1 3/4	16 5/8	16 1/2	2 13/16	2 3/4
Brace A	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace D	14 WF 30	13 7/8	13 3/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace F	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8

Gate No. 2  
Right Elevation  
A-A



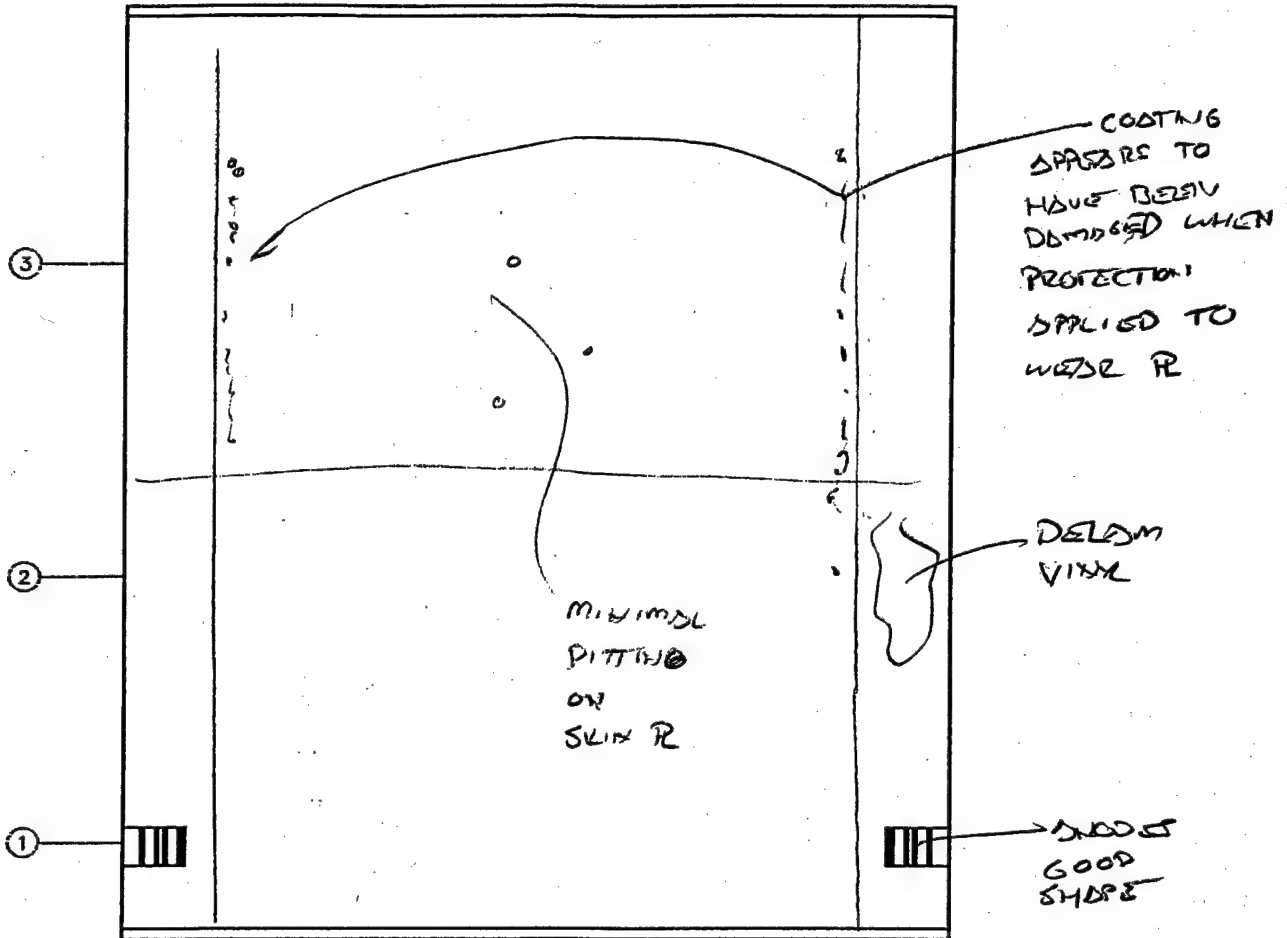
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
Strut 3	14 WF 202	15 5/8		15/16		15 3/4		1 1/2	
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/8	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 1/8	1 13/16	1 3/4	16 5/8	16 1/2	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace C	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace D	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace E	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace F	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace G	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace H	14 WF 30	13 7/8		5/16		6 3/4		3/8	
Brace J	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8

Gate No. 2 Downstream Elevation



Member	Type	Depth d		Web t <sub>w</sub>		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	50	7/16	7/16	16	16	7/8	30/32
Horiz. Girder 2	PL Girder	60 1/2	60 1/2	3/4	3/4	16 1/2	16 1/2	1 1/4	1 1/4
Horiz. Girder 1	PL Girder	60 1/2	60 1/2	1	1	16 1/2	16 1/2	1 1/4	1 1/4
Purlins	ST 10 WF 31	10 1/2	10 1/2	13/32		8 1/4	8 1/4	5/8	9/16
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	5/16	6 3/4	6 7/8	3/8	3/8

Gate No. 2 Upstream Elevation



Gate No. 2 Operation and Trunnion Measurements

Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
39 1/2	39 1/2

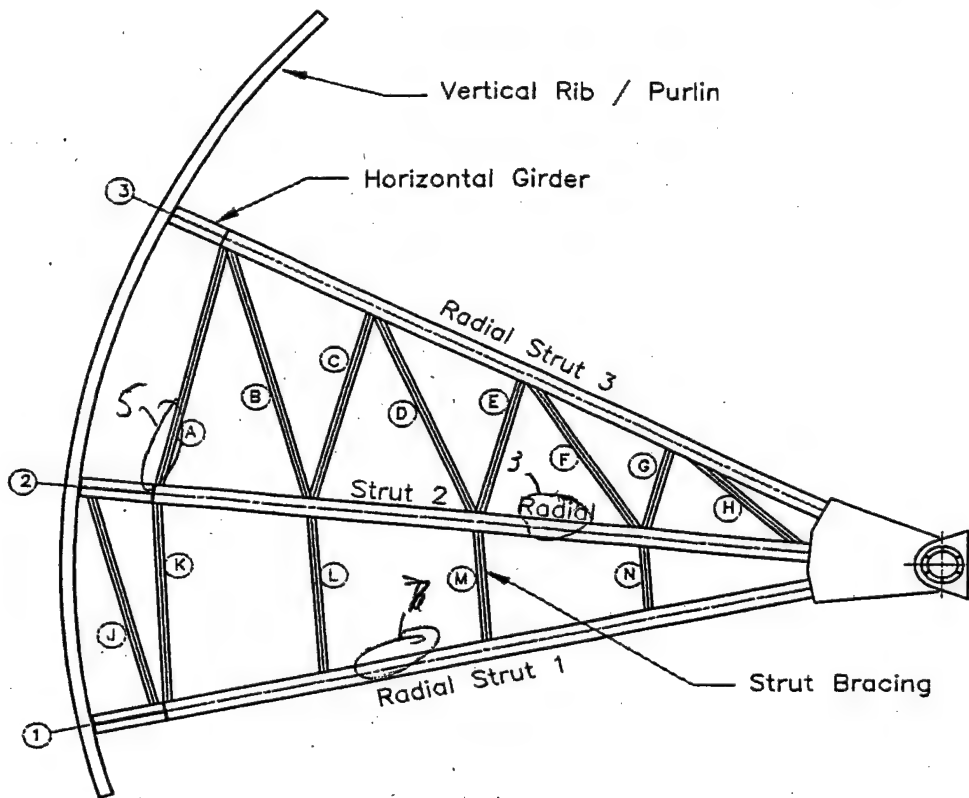
Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

	LEFT		RIGHT	
	Inside	Outside (pier)	Inside	Outside (pier)
Initial Gate Closed	22/32	9/32	17/32	21/32
Gate Full Open	22/32	10/32	17/32	21/32
Final Gate Closed	22/32	10/32	17/32	22/32

3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	0.0000		+0.0020		-0.0005		-0.0045	
US / DS	0.0000		+0.0219		+0.0005		+0.0225	
Transverse	22/32	10/32	22/32	10/32	17/32	22/32	18/32	22/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside

Gate No. 3  
Left Elevation B-B



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 3/4	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 7/16	1 9/16		16 3/8	16 3/16	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16		16 5/8	16 1/2	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace B	14 WF 30	13 7/8	14	5/16		6 3/4	6 7/8	3/8	3/8
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace D	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 7/8	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14 3/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace K	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8

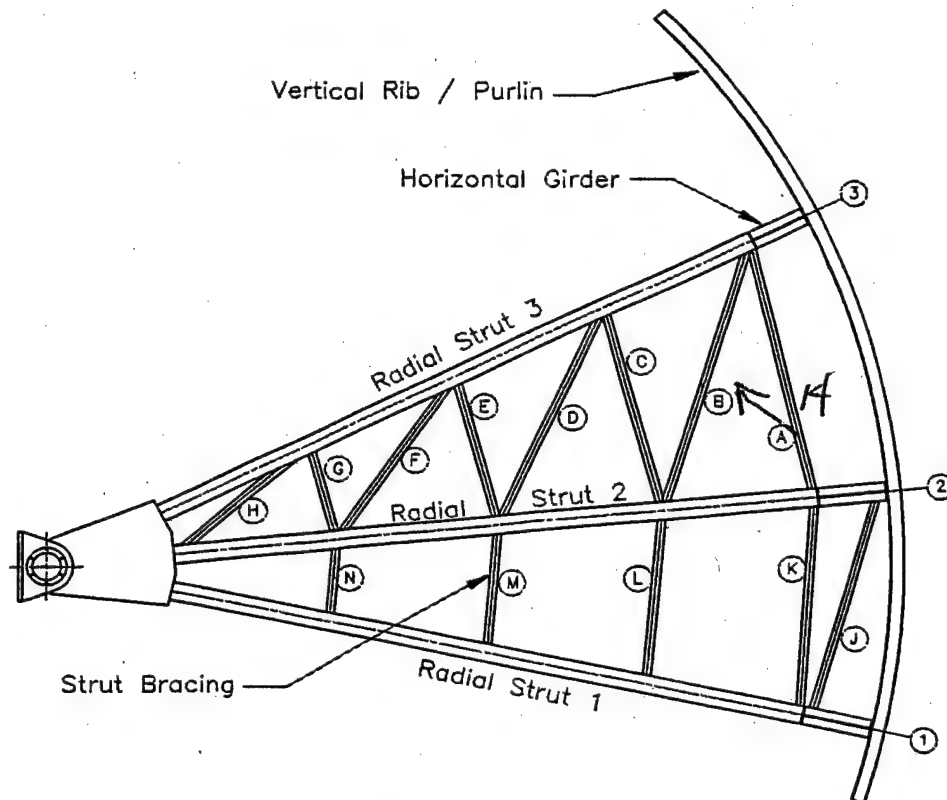
3. Splattered Concrete on 1 second strut.

4. OVERALL shot of LFT Frame NOTE. CONCRETE splatter and light rust

5. Vert Brace light Rust Typ. All braces

2. CONCRETE splatter on bot. strut

Gate No. 43  
Right Elevation  
A-A

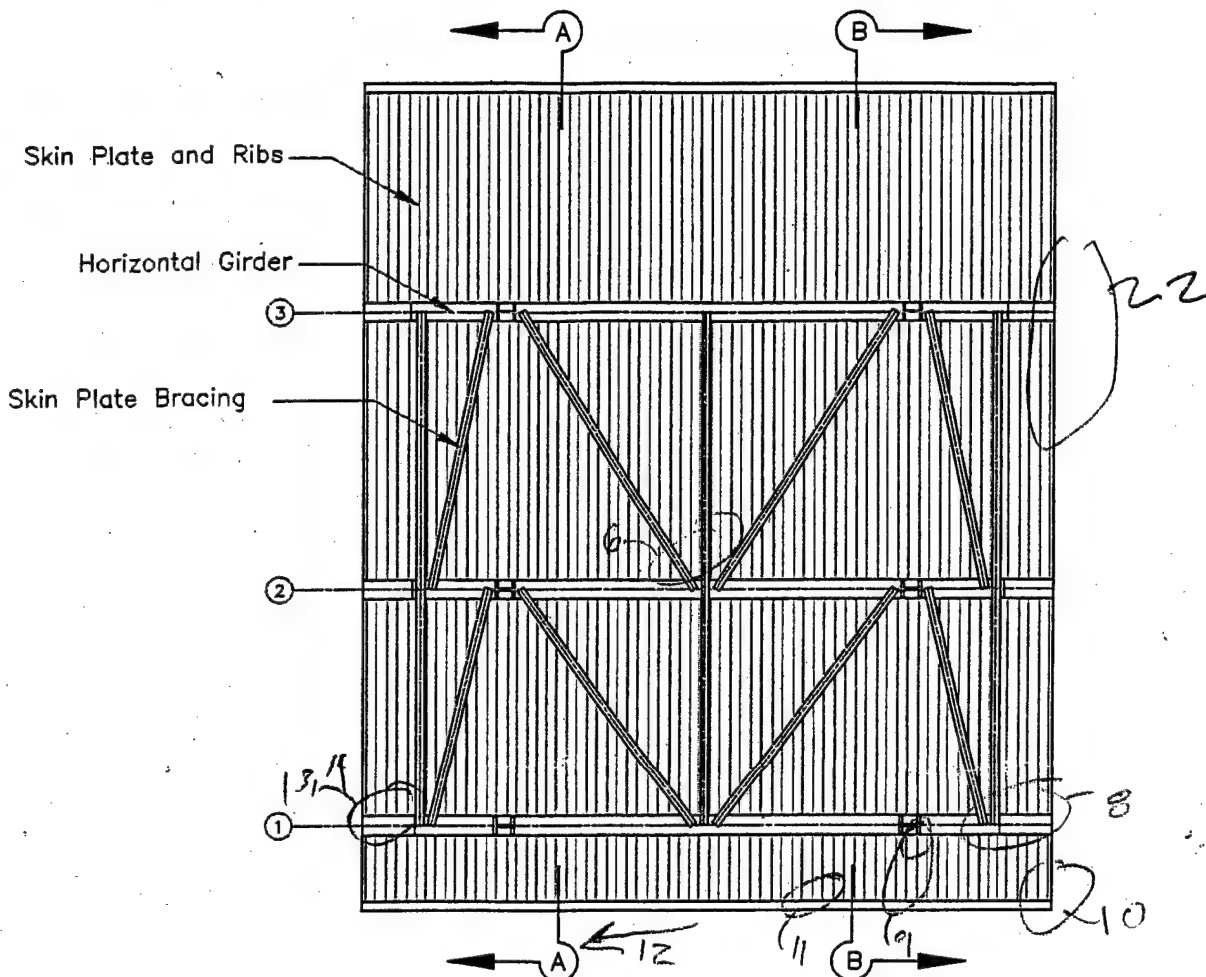


Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
						Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 13/16	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/4	2 7/16	2 7/2
Strut 1	14 WF 398	18 1/4	18 3/16	1 13/16		16 5/8	16 7/16	2 13/16	2 1/16
Brace A	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 15/16	3/8	3/8
Brace D	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 10/16	3/8	3/8
Brace E	14 WF 30	13 7/8	13 3/4	5/16		6 3/4	6 15/16	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 15/16	3/8	3/8
Brace G	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	6 13/16	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8

14. Shot of FRM. NOTE Light Rust on most Members



Gate No. 3 Downstream Elevation



Member	Type	Depth d		Web t <sub>w</sub>		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	50	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	60 7/16	3/4	3/4	16 1/2	16 9/16	1 1/4	1 1/4
Horiz. Girder 1	PL Girder	60 1/2	60 1/2	1	1 1/16	16 1/2	16 1/2	1 1/4	1 1/4
Purlins	ST 10 WF 31	10 1/2	10 1/2	13/32	9/16	8 1/4	8 5/16	5/8	
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	3/16	6 3/4	6 2/4	3/8	3/8

2. LEFT Purlin light rust w/ min deposits

6. Light rust on Bracing Typ.

8. Standing H<sub>2</sub>O on Bot. Girder NOTE light rust

9. Drain hole w/ continuous flow from above

10. Side Seal leak. (LEFT)

11. Standing H<sub>2</sub>O and muck @ Bot. Pt.

12. Looking RT. Along bottom seal

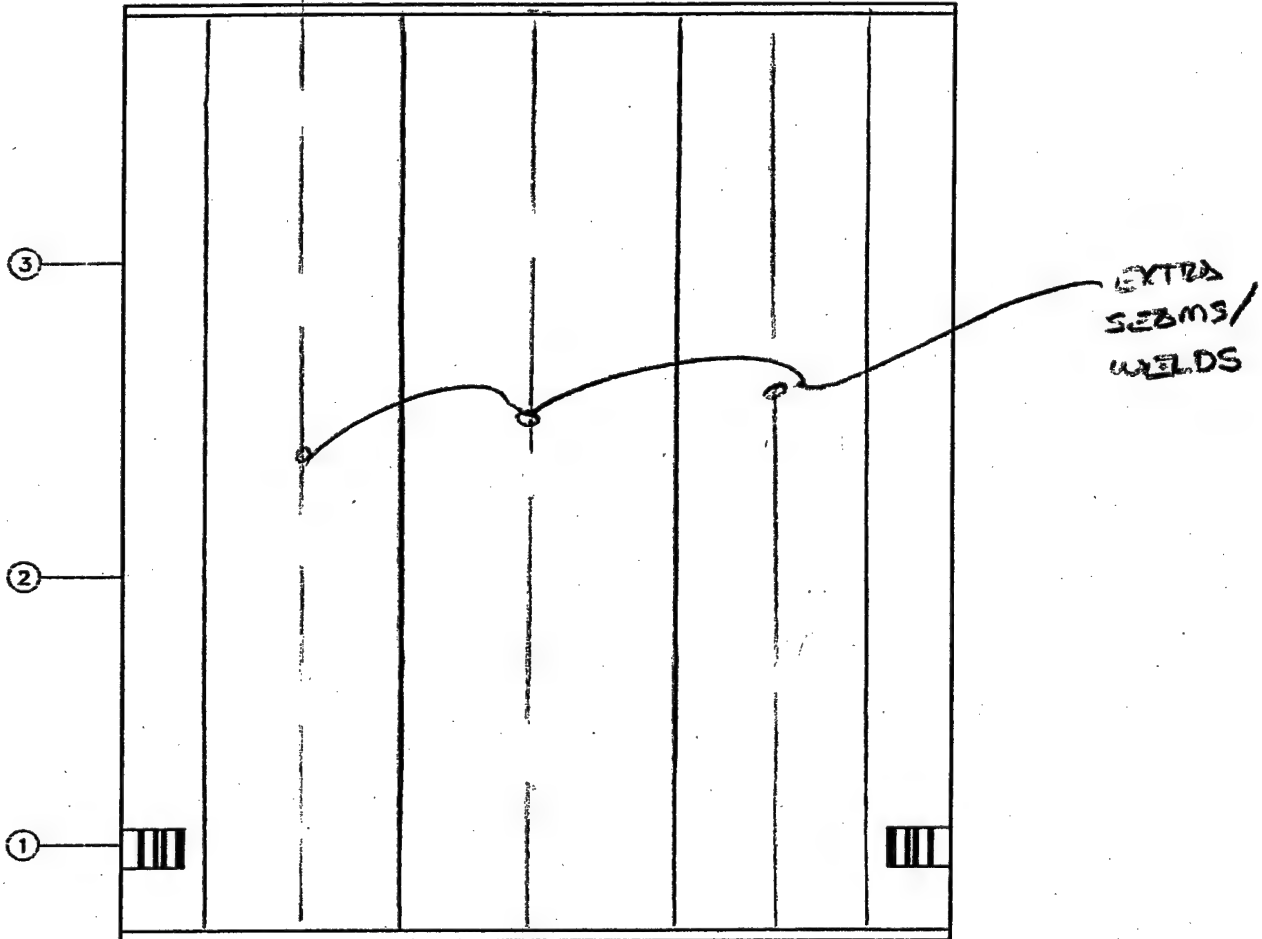
13, 14. Moderate to heavy rust @ Bot Girder @ Brace Pts

HDR Engineering, Inc.  
Corp of Engineers - Walla Walla  
Little Goose Dam

Inspection Team SMP TDB HAY AMD  
Weather \_\_\_\_\_

Date 10/19  
Sheet 4

Gate No. 3 Upstream Elevation



- VERY LITTLE COR.

- NOT PITS TOP 20'

Gate No. 3 Operation and Trunnion Measurements

Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
42	42

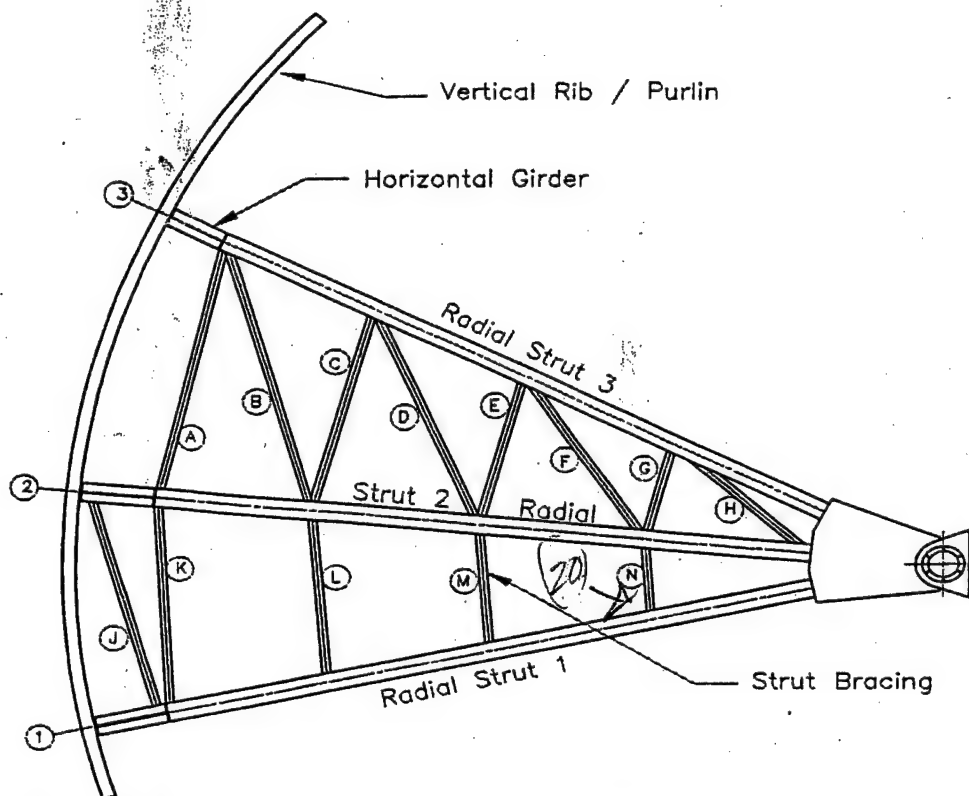
Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

	LEFT		RIGHT	
	Inside	Outside (pier)	Inside	Outside (pier)
Initial Gate Closed	28/32	18/32	18/32	14/32
Gate Full Open	28/32	18/32	18/32	14/32
Final Gate Closed	28/32	18/32	18/32	14/32

3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	+0.0005		+0.0070		-0.0010		-0.0130	
US / DS	0.0000		+0.0308		-0.0025		+0.0250	
Transverse	28/32	18/32	28/32	18/32	18/32	14/32	19/32	13/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside

Gate No. 4  
Left Elevation B-B



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 1/4	15/16	—	15 3/4	✓	1 1/2	✓
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16	—	16 3/8	✓	2 7/16	✓
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16	—	16 5/8	11 1/2	2 13/16	✓
Brace A	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	5/16
Brace B	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	✓	3/8	5/16
Brace C	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	✓	3/8	5/16
Brace D	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	✓	3/8	5/16
Brace E	14 WF 30	13 7/8	14	5/16	—	6 3/4	13 1/16	3/8	✓
Brace F	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	5/16
Brace G	14 WF 30	13 7/8	✓	5/16	—	6 3/4	6 3/4	3/8	✓
Brace H	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓ 5/16	3/8	5/16
Brace J	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	1/4
Brace K	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	✓
Brace L	14 WF 30	13 7/8	13 3/4	5/16	✓	6 3/4	16 1/4	3/8	✓
Brace M	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	✓
Brace N	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	✓

(21) Fine layer of mud flaking off. typ

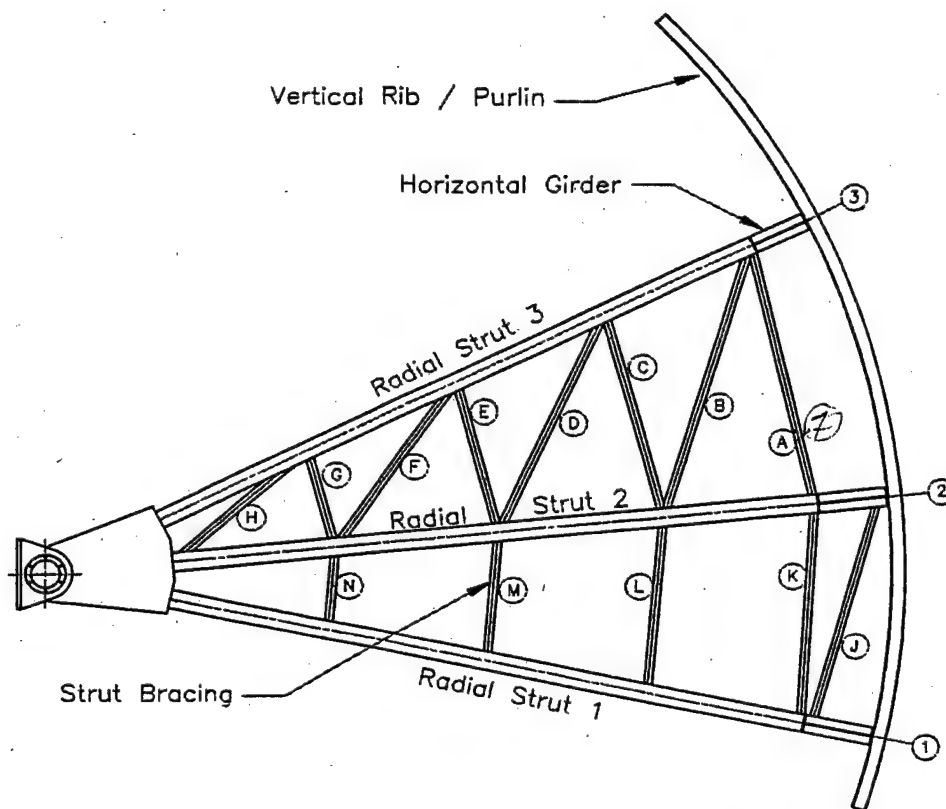
(22) Bottom Seal, left.

(23) Spraying water, left.

(24) Gate face - notice paint

(25) Side seals, left.

Gate No. 4  
Right Elevation  
A-A



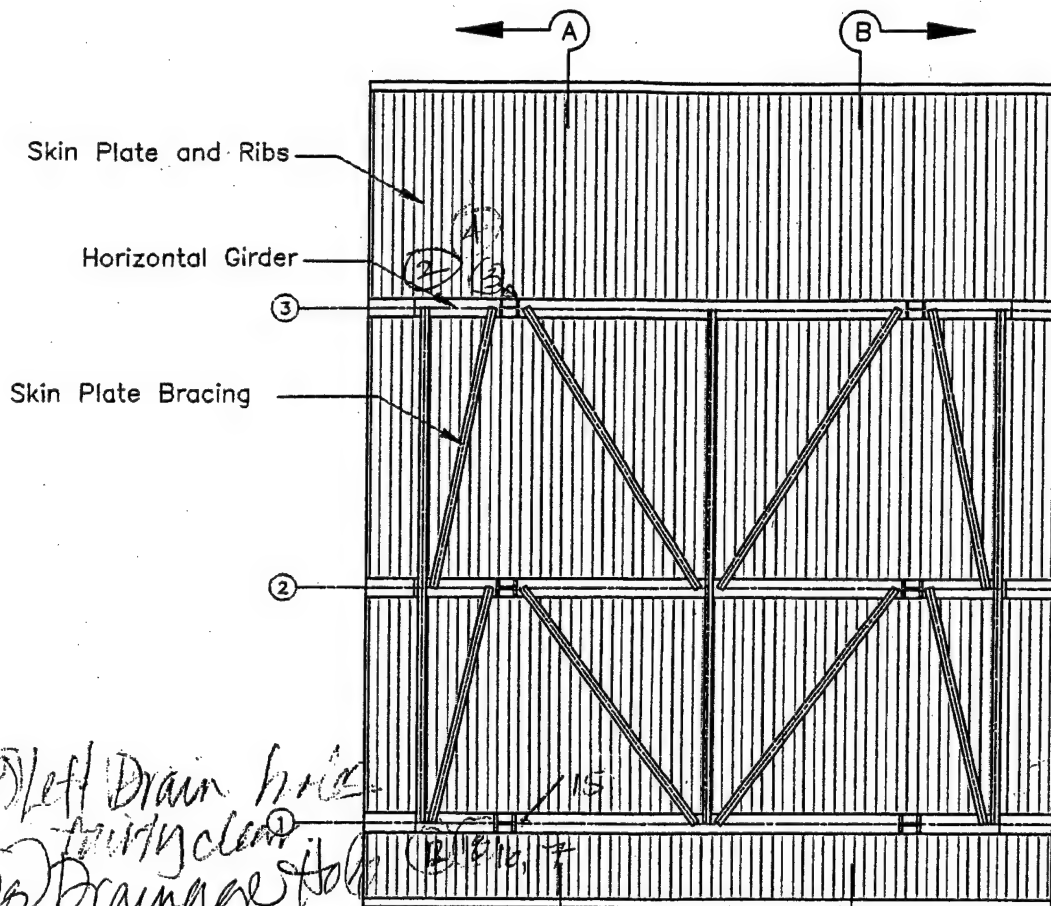
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	✓	15 5/8	✓	15 3/4	✓	1 1/2	✓
Strut 2	14 WF 342	17 1/2	✓	17 1/2	✓	16 3/8	✓	2 7/16	✓
Strut 1	14 WF 398	18 1/4	✓	18 1/4	✓	16 5/8	✓	2 13/16	✓
Brace A	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace B	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace C	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace D	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace E	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace F	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace G	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace H	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace J	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace K	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace L	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace M	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓
Brace N	14 WF 30	13 7/8	✓	5/16	✓	6 3/4	✓	3/8	✓

⑦ Strange raised marks, like candy buttons on skin plate also.

⑧ Bo

⑨ Corrosion patch, bad alignment.

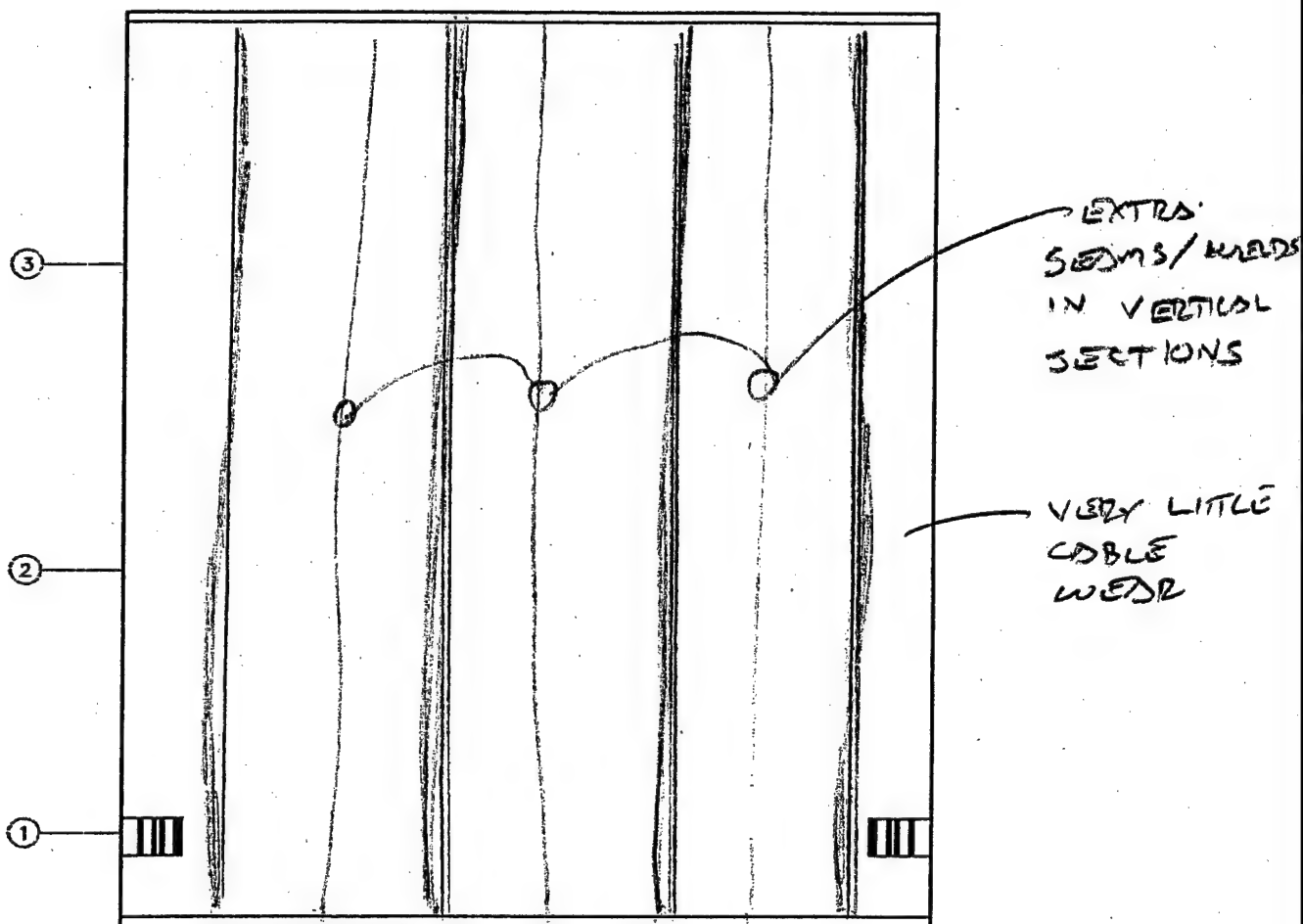
Gate No. 4 Downstream Elevation



Member	Type	Depth d		Web t <sub>w</sub>		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	✓	7/16	✓	16	✓	7/8	✓
Horiz. Girder 2	PL Girder	60 1/2	✓	3/4	✓	16 1/2	✓	1 1/4	15/16
Horiz. Girder 1	PL Girder	60 1/2	✓	1	✓	16 1/2	✓	1 1/4	15/16
Purlins	ST 10 WF 31	10 1/2	✓	13/32	✓	8 1/4	✓	5/8	✓
Skin Plate Bracing	ST 7 WF 15	7	✓	1/4	✓	6 3/4	✓	3/8	✓

- ① Gate No. 4
- ② Light Rust on purlins + riv.
- ③ Stiffeners not welded to gate face, riv. connecting in ends.
- ④ Rivet, Bottom Seal.
- ⑤ Strange Divots and paintless marks top on skin plate.
- ⑥ Light Rust on Vertical Braces.
- ⑦ Ponding Water Bottom Girder.
- ⑧ Before, Corrosion Spots + ⑨.
- ⑩ After.
- ⑪ Corrosion Water, Bot seal, center.

Gate No. 4 Upstream Elevation



- TYPICAL PITTING, LIGHTER THAN USUAL



### Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
	

TOO MUCH LEAKAGE  
AND FLOW FROM  
STOPLOGS TO  
MEASURE

### Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

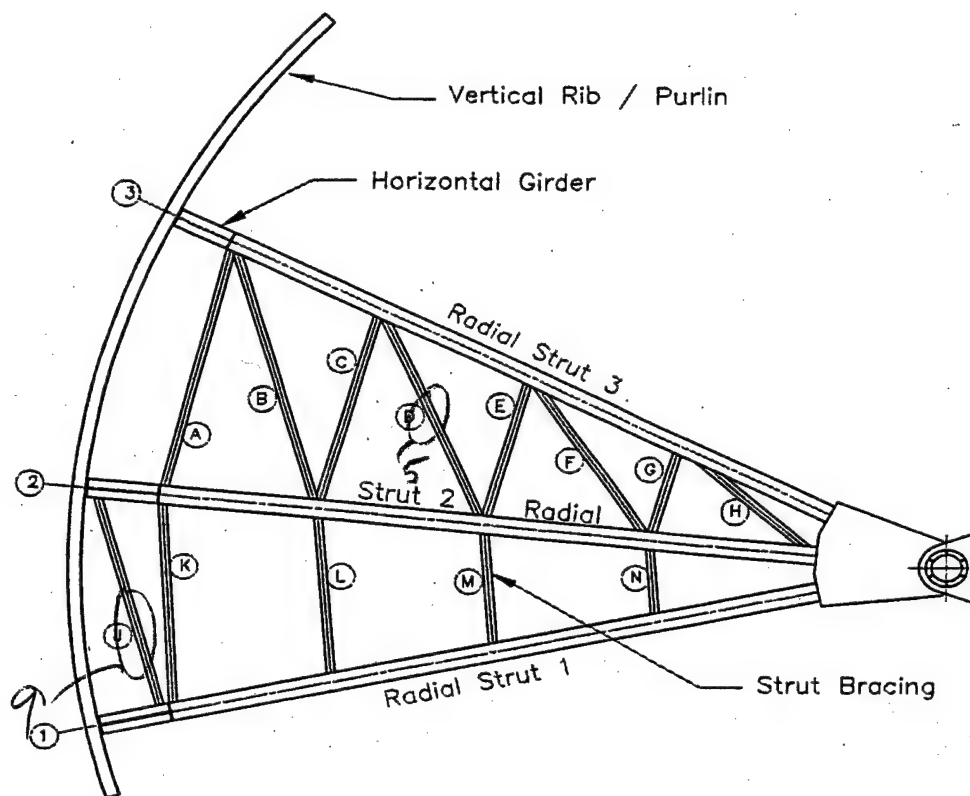
	LEFT			RIGHT	
	Inside	Outside (pier)		Inside	Outside (pier)
Initial Gate Closed	15/32	13/32		14/32	27/32
Gate Full Open	15/32	12/32		14/32	27/32
Final Gate Closed	15/32	12/32		14/32	28/32

### 3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	0.0000		+0.0030		-0.0010		-0.0085	
US / DS	0.0000		+0.0320		-0.0020		+0.0250	
Transverse	15/32	12/32	15/32	12/32	14/32	28/32	14/32	27/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside

[illegible]

Gate No. 5  
Left Elevation B-B



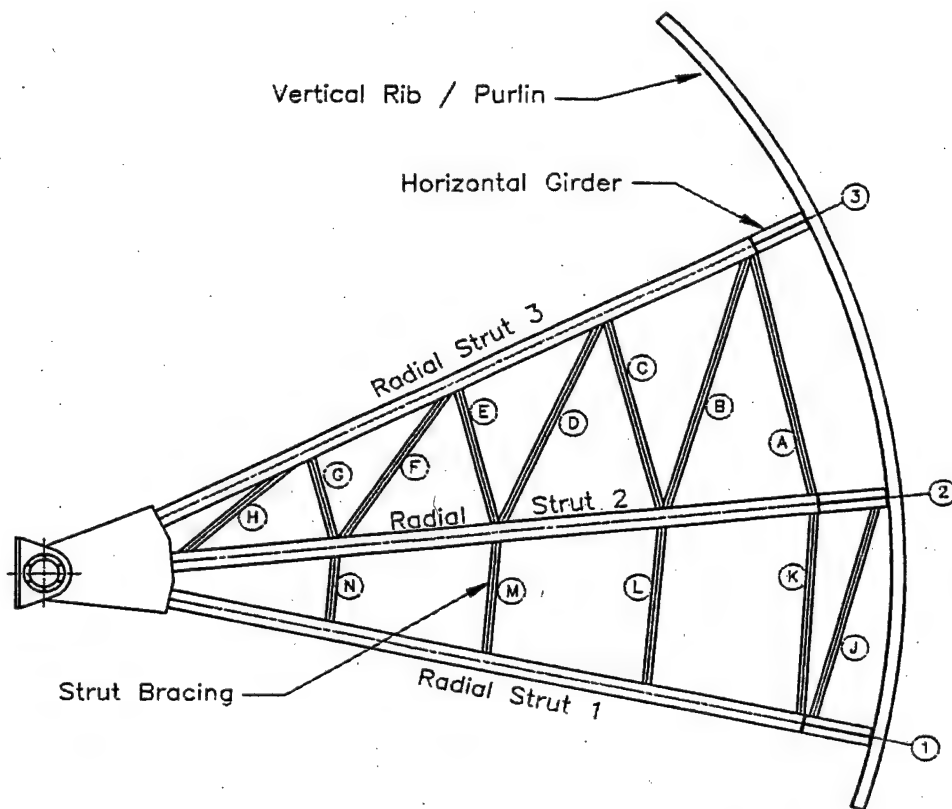
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	13 5/16	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/8	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16		16 5/8	16 5/8	2 13/16	2 3/4
Brace A	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 7/8	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace D	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace F	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16		6 3/4	6 7/8	3/8	3/8
Brace J	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace K	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 7/8	3/8	3/8

5. Paint Failure w/ Light Rust (Typ All braces)

9. Light Rust ON DIA. BRACE (Typ)

13. OVERALL SHOT OF LEFT FRAME NOTE BAD PAINT

Gate No. 5  
Right Elevation  
A-A



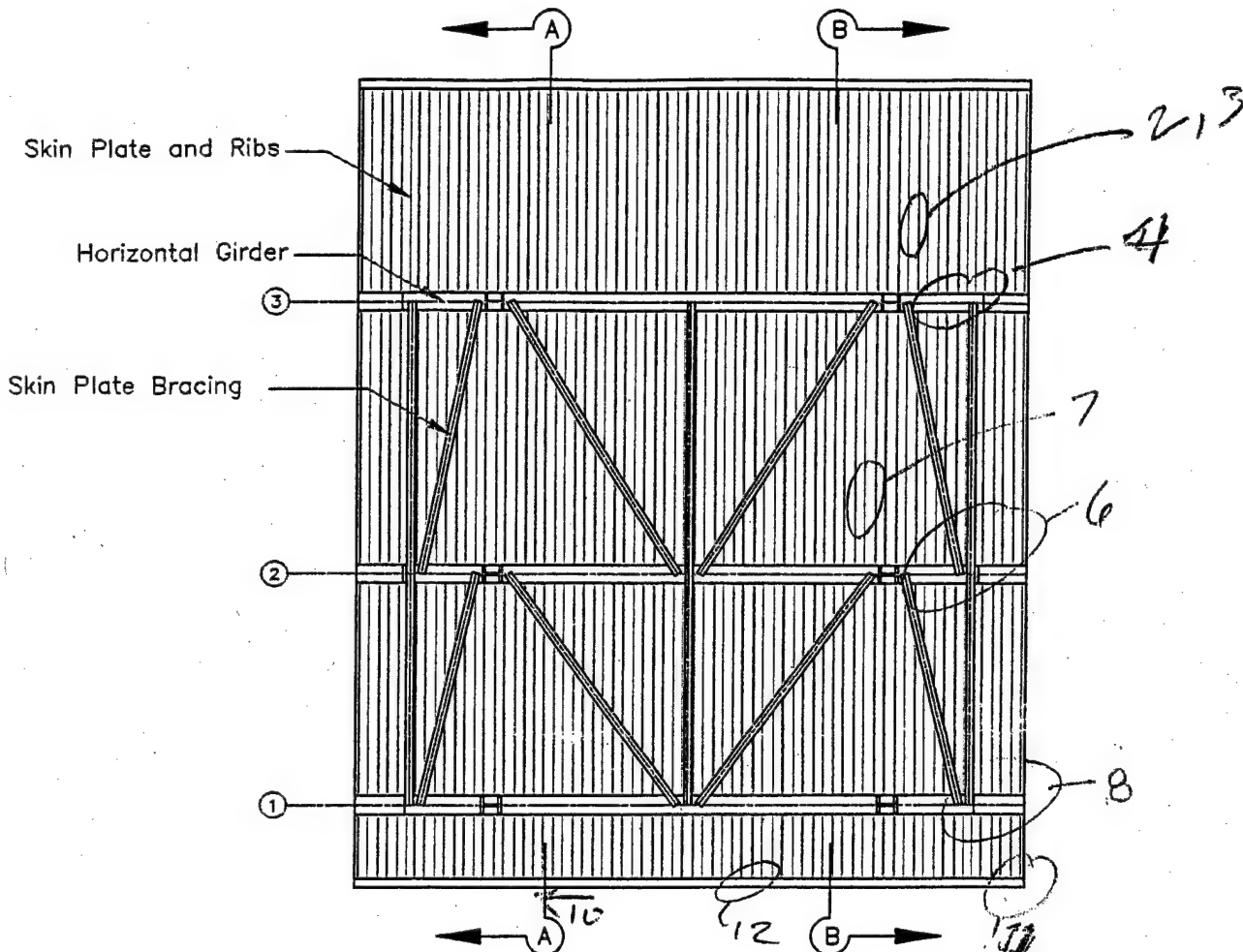
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
Strut 3	14 WF 202	15 5/8	15 1/8	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/8	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 3/8	1 13/16		16 5/8	16 1/2	2 13/16	2 7/8
Brace A	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 15/16	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 15/16	3/8	3/8
Brace C	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace D	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace E	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 15/16	3/8	3/8
Brace F	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace K	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8

14. Overall Pic of Gate

15. Left Trunnion

16. RT. Trunnion w/clogged Drain hole

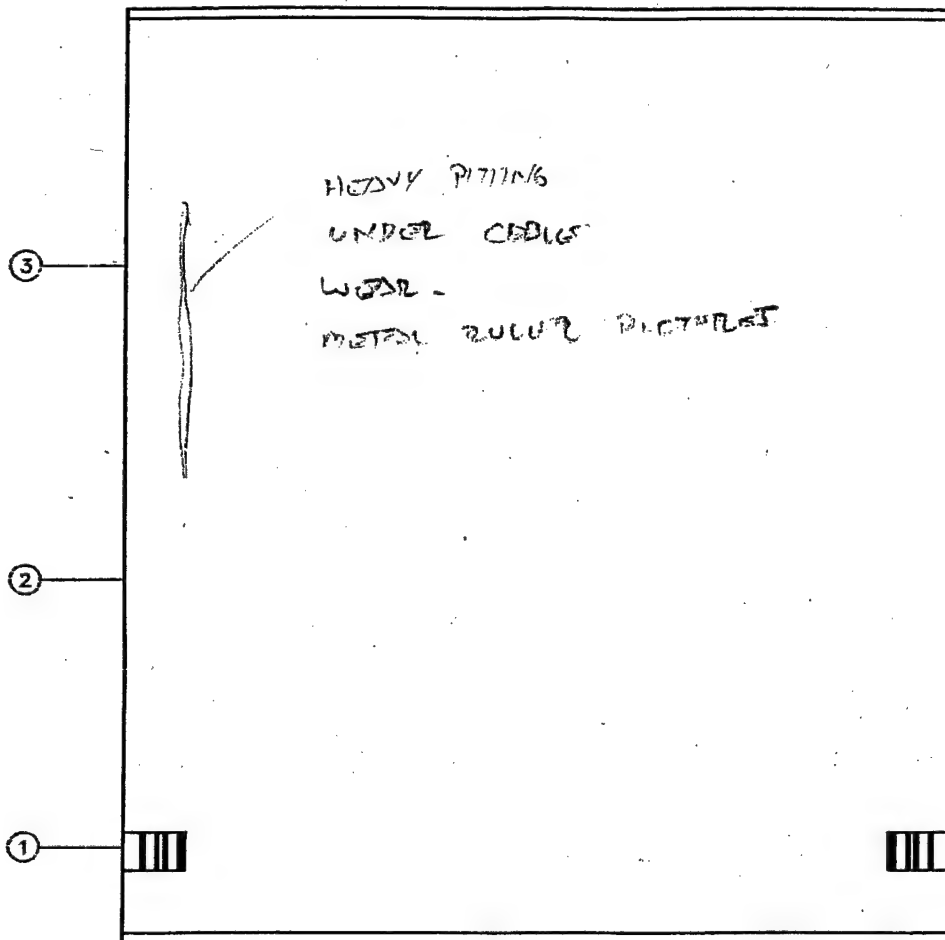
Gate No. 5 Downstream Elevation



Member	Type	Depth		Web		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	49 1/4	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	60 1/2	3/4	3/4	16 1/2	16 1/2	1 1/4	1 1/4
Horiz. Girder 1	PL Girder	60 1/2	60 1/2	1	1 1/16	16 1/2	16 1/2	1 1/4	1 1/4
Purlins	ST 10 WF 31	10 1/2	10 1/2	13/32	13/32	8 1/4	8 1/4	5/8	5/8
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	5/16	6 3/4	6 3/4	3/8	3/8

- 2, 3. Delaminated Pnt and light Rust ON GATE FACE
4. Light Rust TOP GIRDER
6. Light Rust ON GIRDERS AND BRACES NOTE Delam ON GATE FACE
7. Delam. ON GATE FACE w/ light Rust. These Delam spots ARE TYP ACROSS ENTIRE GATE FACE.
8. SIDE SEAL LEAK @ Bot GIRDER NOTE Light Rust & MINOR / Dep.
10. Bottom Seal looking Right
11. LEFT CORNER leak
12. Bottom Plate w/ STANDING H<sub>2</sub>O

Gate No. 5 Upstream Elevation



- BEST CONDITION OF ANY GATES SEEN
- MINIMAL PITTING
- EXCESSIVE STOP LOS WEAR, COULD NOT GO UNDER SILL DO TO FALLING WATER -

Gate No. 5 Operation and Trunnion Measurements

Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
39 1/4	39

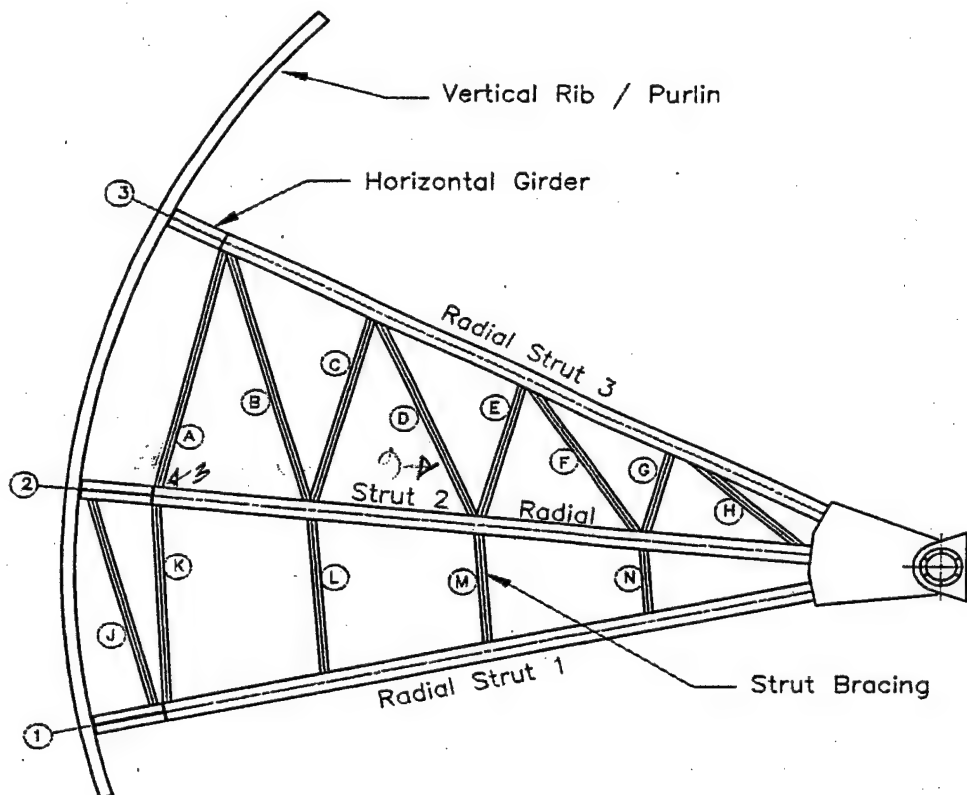
Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

	LEFT		RIGHT	
	Inside	Outside (pier)	Inside	Outside (pier)
Initial Gate Closed	22/32	16/32	20/32	18/32
Gate Full Open	21/32	15/32	20/32	18/32
Final Gate Closed	21/32	16/32	20/32	18/32

3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	+0.0010		-0.0085		0.0005		-0.0020	
US / DS	0.0000		+0.0230		0.0000		+0.0380	
Transverse	21/32	16/32	22/32	16/32	20/32	18/32	20/32	18/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside

Gate No. 6  
Left Elevation B-B

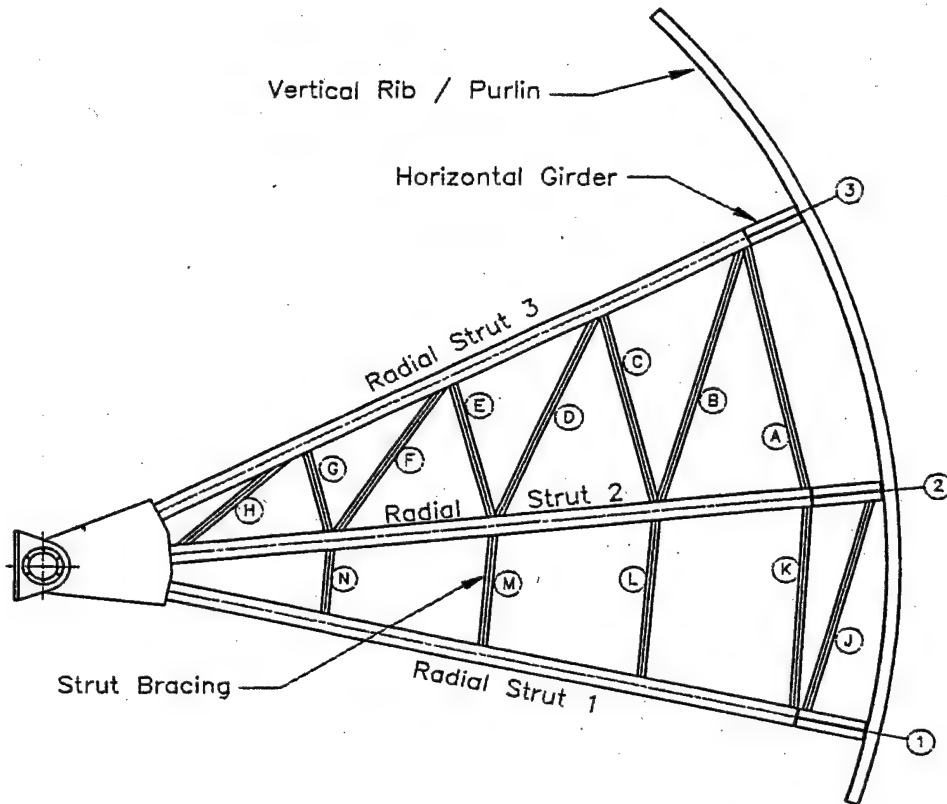


Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
Strut 3	14 WF 202	15 5/8	✓	15/16	—	15 3/4	✓	1 1/2	✓
Strut 2	14 WF 342	17 1/2	✓	1 9/16	—	16 3/8	✓	2 7/16	✓
Strut 1	14 WF 398	18 1/4	✓	1 13/16	—	16 5/8	✓	2 13/16	✓
Brace A	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace B	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace C	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace D	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace E	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace F	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace G	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace H	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace J	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace K	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace L	14 WF 30	13 7/8	✓	5/13	—	6 3/4	✓	3/8	✓
Brace M	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓
Brace N	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	✓

- ① Damage to  
② Rust on B, top on gate  
③ Rust on A  
④ Weld 2 on inside of 4th purlin  
⑤ Flaking paint / lime depos  
⑥ Paint line from previous  
⑦ Pitting coat and strut  
⑧ Rust on gate release beam



Gate No. 10  
Right Elevation  
A-A



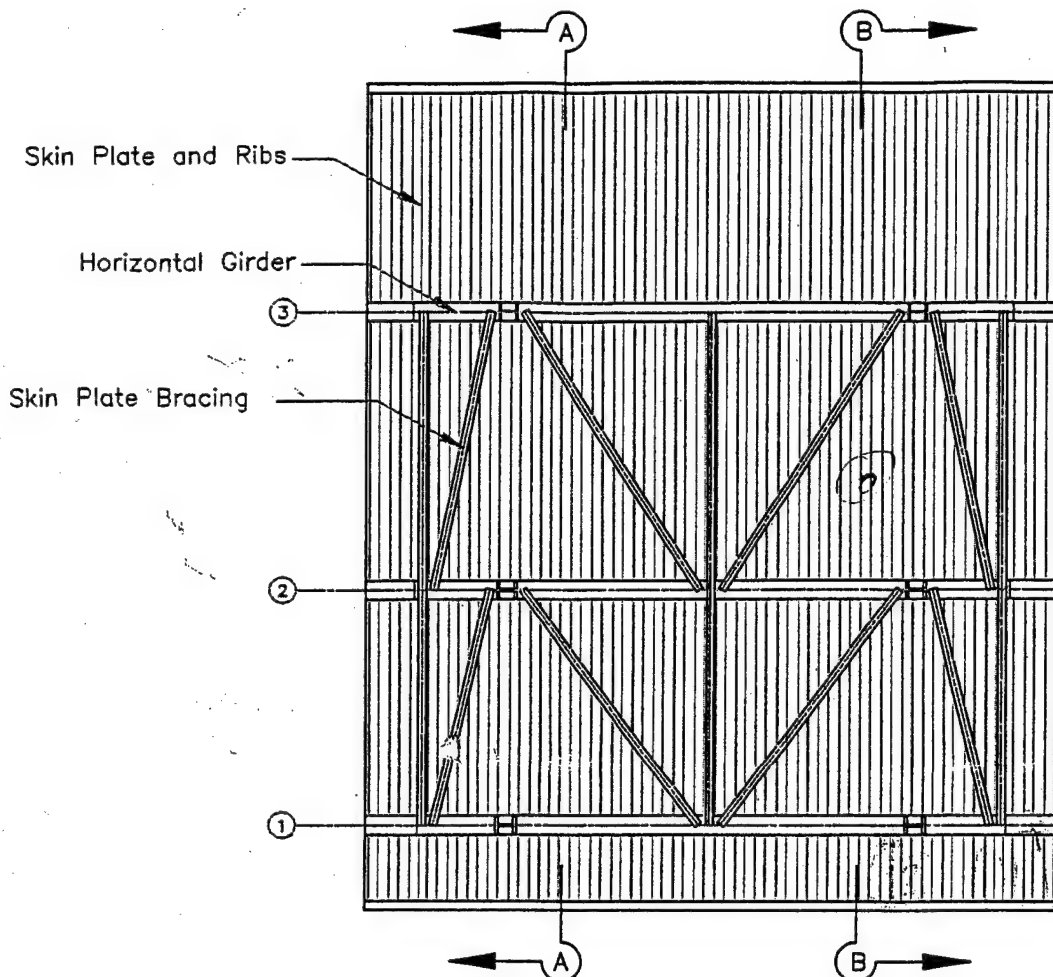
Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 5/8	15/16	—	15 3/4	15 5/8	1 1/2	✓
Strut 2	14 WF 342	17 1/2	✓	1 9/16	—	16 3/8	16 3/8	2 7/16	✓
Strut 1	14 WF 398	18 1/4	✓	1 13/16	—	16 5/8	16 5/8	2 13/16	✓
Brace A	14 WF 30	13 7/8	✓	5/16	—	6 3/4	6 3/4	3/8	5/16
Brace B	14 WF 30	13 7/8	✓	5/16	—	6 3/4	6 3/4	3/8	✓
Brace C	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	✓	3/8	5/16
Brace D	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	✓	3/8	5/16
Brace E	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	5/16
Brace F	14 WF 30	13 7/8	14	5/16	—	6 3/4	✓	3/8	5/16
Brace G	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	5/16
Brace H	14 WF 30	13 7/8	13 5/16	5/16	—	6 3/4	10 3/4	3/8	5/16
Brace J	14 WF 30	13 7/8	✓	5/16	—	6 3/4	10 7/8	3/8	5/16
Brace K	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	5/16
Brace L	14 WF 30	13 7/8	✓	5/16	—	6 3/4	10 7/8	3/8	5/16
Brace M	14 WF 30	13 7/8	✓	5/16	—	6 3/4	✓	3/8	5/16
Brace N	14 WF 30	13 7/8	14	5/16	—	6 3/4	10 1/8	3/8	5/16



Gate No.

U

Downstream Elevation



(10) (20) Leak in middle, water coming through hole

Member	Type	Depth		Web		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	✓	7/16	✓	16	✓	7/8	15/16
Horiz. Girder 2	PL Girder	60 1/2	20 3/4	3/4	✓	16 1/2	✓	1 1/4	✓
Horiz. Girder 1	PL Girder	60 1/2	10 3/4	1	—	16 1/2	✓	1 1/4	✓
Purlins	ST 10 WF 31	10 1/2	✓	13/32	✓	8 1/4	✓	5/8	✓
Skin Plate Bracing	ST 7 WF 15	7	1 3/4	1/4	✓	6 3/4	✓	3/8	✓

(8) Strange divits in skin plate

(9) Bottom member time

(10) Cable connections, pending work

(11) Repair

(12) Bottom girder, damaged

(13) Lack of drainage in bottom seal

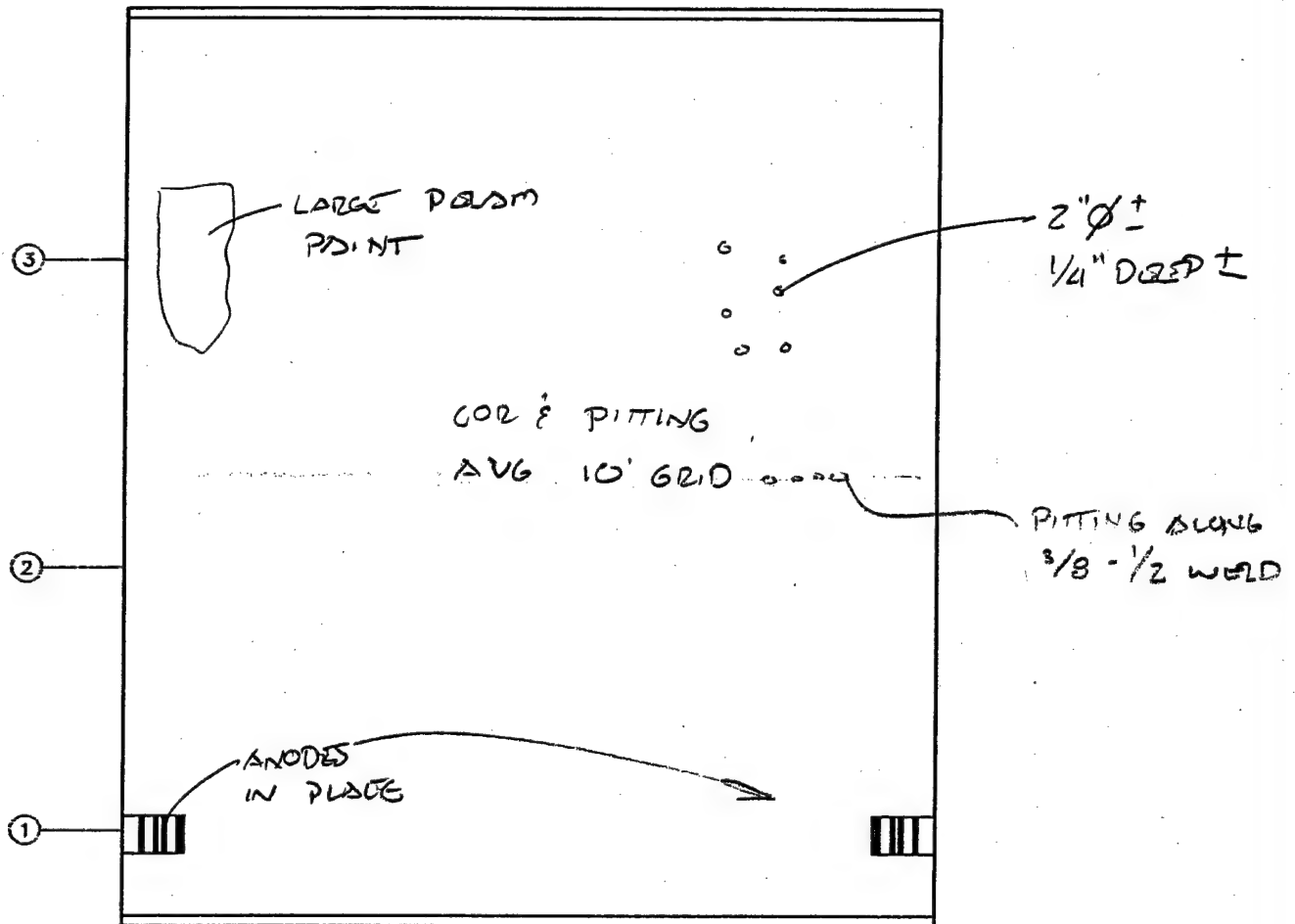
(14) Extra bottom seal

(15) Drainage hole from bottom girder

(16) Drainage hole, right

22 23

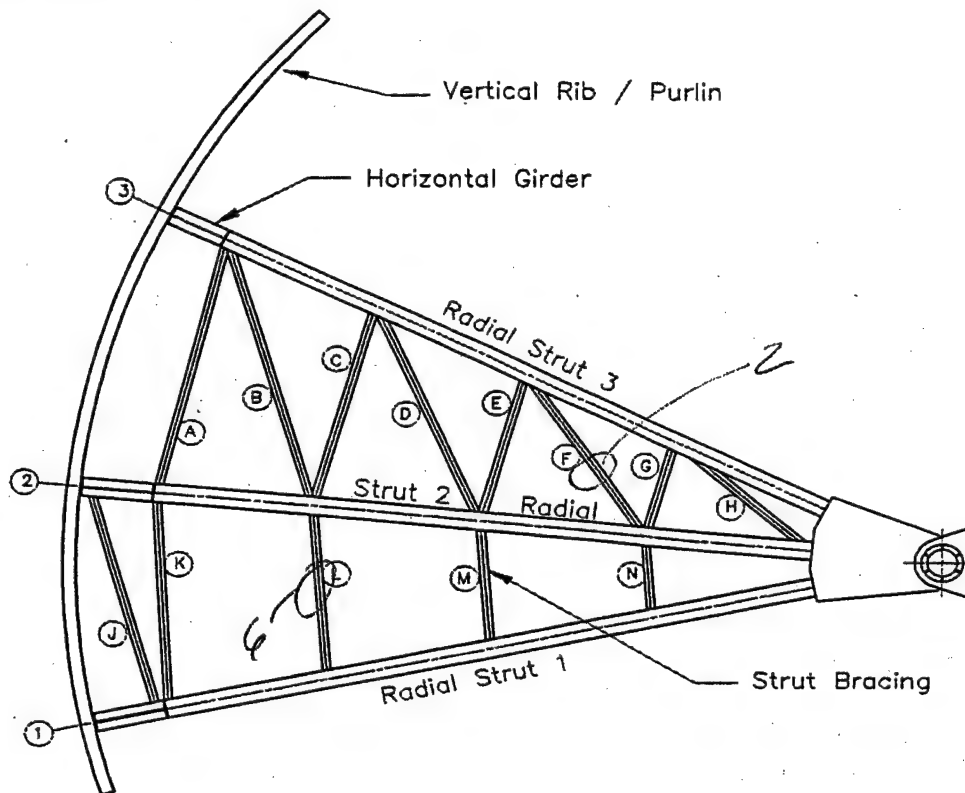
Gate No. 6 Upstream Elevation



BRACE MOTOR LOCKED & BURNING @ 25' OPEN 45 min delay

[illegible]

Gate No. 7  
Left Elevation B-B  
Right

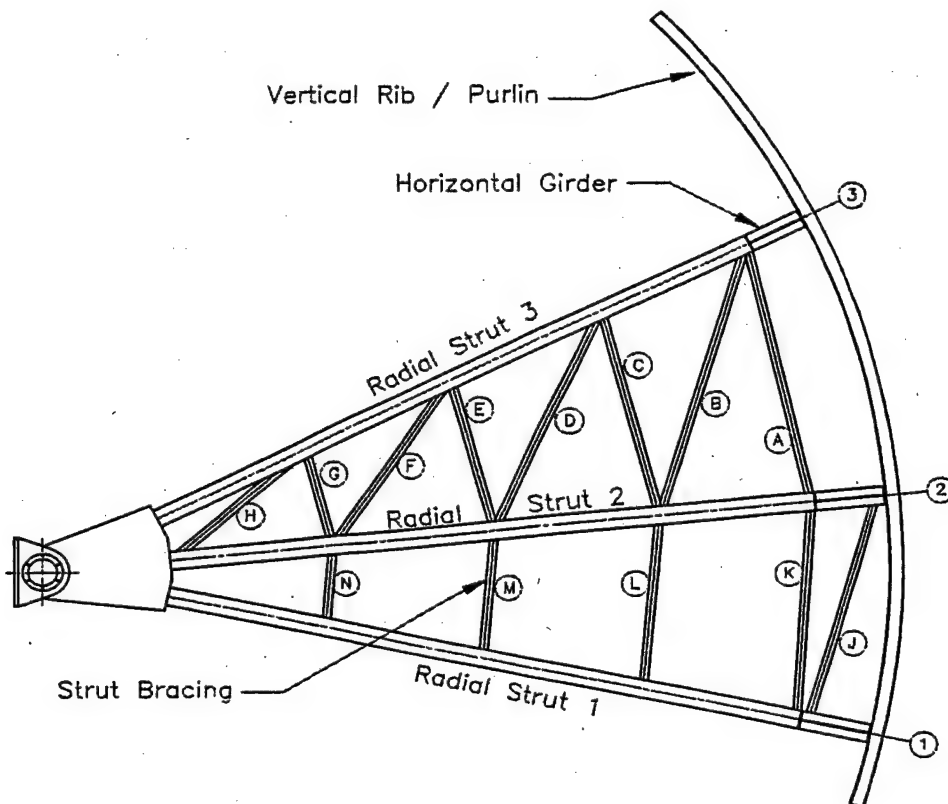


Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
Strut 3	14 WF 202	15 5/8	15 5/8	15/16		15 3/4	15 3/4	1 1/2	1 1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 1/2	2 7/16	2 3/4
Strut 1	14 WF 398	18 1/4	18 5/16	1 13/16		16 5/8	16 1/2	2 13/16	2 3/4
Brace A	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace D	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace E	14 WF 30	13 7/8	13 13/16	5/16		6 3/4	6 15/16	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace H	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 1/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 7/8	3/8	3/8
Brace M	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 13/16	5/16		6 3/4	6 3/4	3/8	3/8

2. PEELED RUST @ DIA F

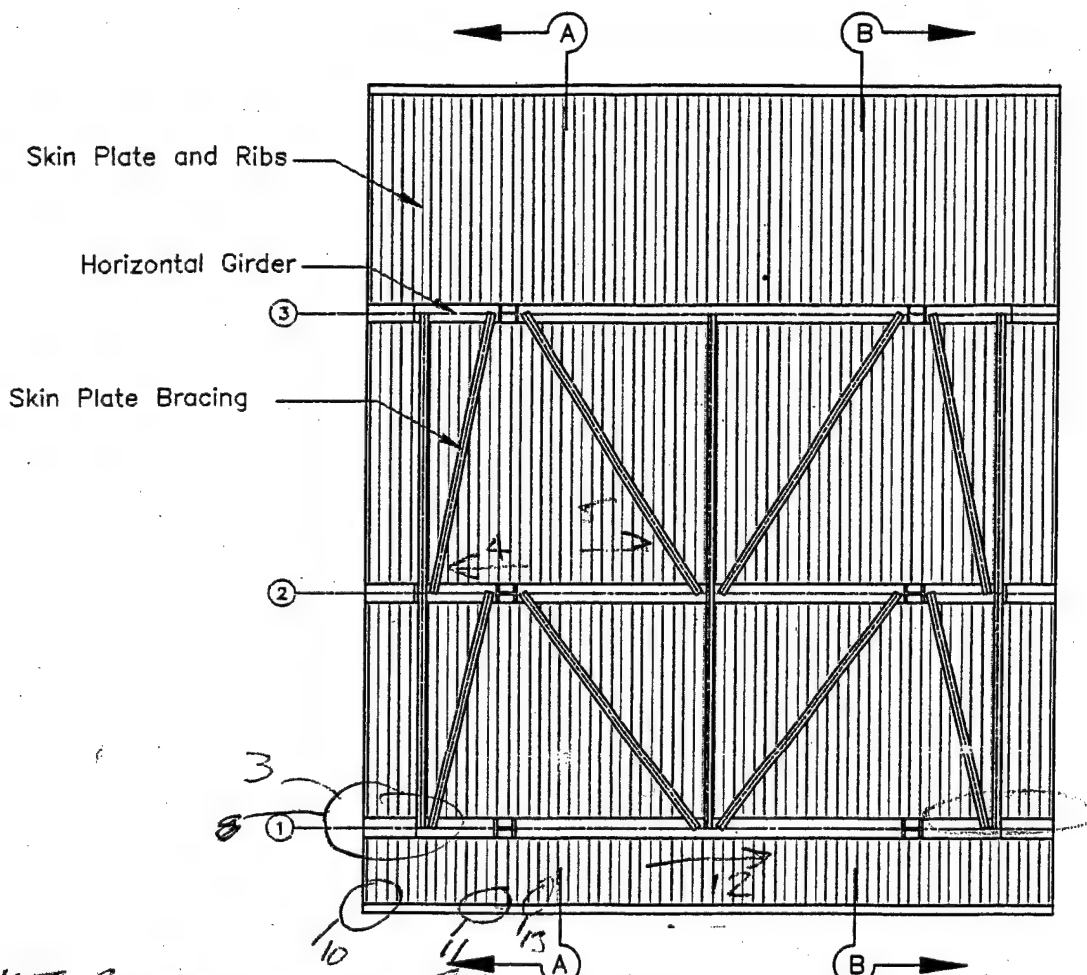
1/2" Deflection in Flange Vert. "L" ± 1/4" Deflection

Gate No. 7  
Right Elevation  
A-A



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	b <sub>f</sub>		t <sub>f</sub>	
Strut 3	14 WF 202	15 5/8	15 3/4	15/16		15 3/4	15 3/4	1 1/2	1/2
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 7/16	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16		16 5/8	16 1/2	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 7/8	3/8	3/8
Brace D	14 WF 30	13 7/8	14	5/16		6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 1/8	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	13 13/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace K	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 4/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 5/4	3/8	3/8

Gate No. 7 Downstream Elevation

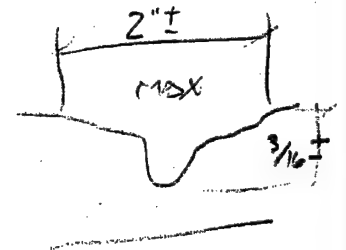
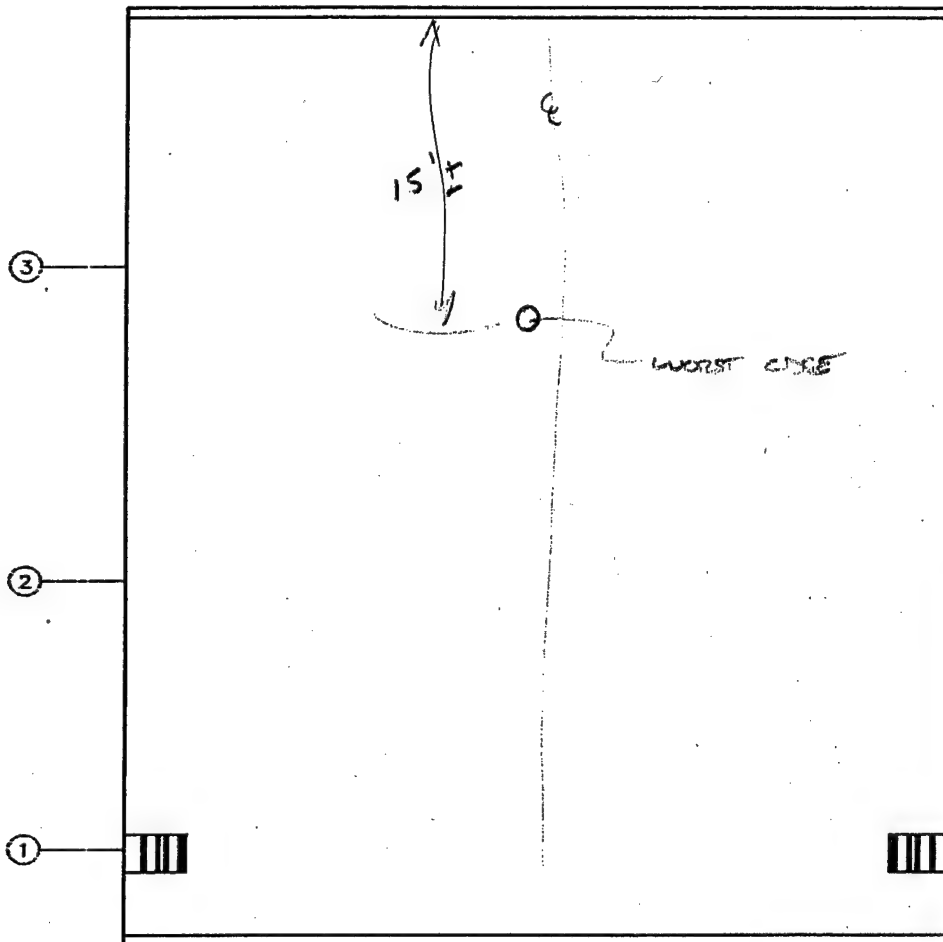


NOTE. PAINT ON GATE FAILING. FLAKY W/ LIGHT RUST

Member	Type	Depth		Web		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	49 3/8	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	60 1/2	3/4	6/4	16 1/2	16 1/2	1 1/4	1 5/16
Horiz. Girder 1	PL Girder	60 1/2	60 3/8	1	1 1/16	16 1/2	16 1/2	1 1/4	1 5/16
Purlins	ST 10 WF 31	10 1/2	10 3/8	13/32		8 1/4	8 3/16	5/8	5/8
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	1/4	6 3/4	6 3/16	3/8	3/8

3. LEAK IN SIDE SEAL W/ STANDING H<sub>2</sub>O IN BOT. GIRDER
4. RT. FRAME LIGHT RUST
5. Looking left NOTE LIGHT RUST ON ALL MEMBERS
8. Standing H<sub>2</sub>O ON BOT. GIRDER
7. GATE FACE PAINT FAILURE
10. SIDE SEAL LEAK W/ LIGHT RUST AND MIN. DEPOSIT
11. Bottom Plt. Full of H<sub>2</sub>O w/ muck
12. Along Bot GIRDER LIGHT RUST ON ALL MEMBERS
13. Moderate Rust on Purlin web DUE TO STANDING H<sub>2</sub>O
14. Moderate Rust on BRACE PHS.

Gate No. 7 Upstream Elevation



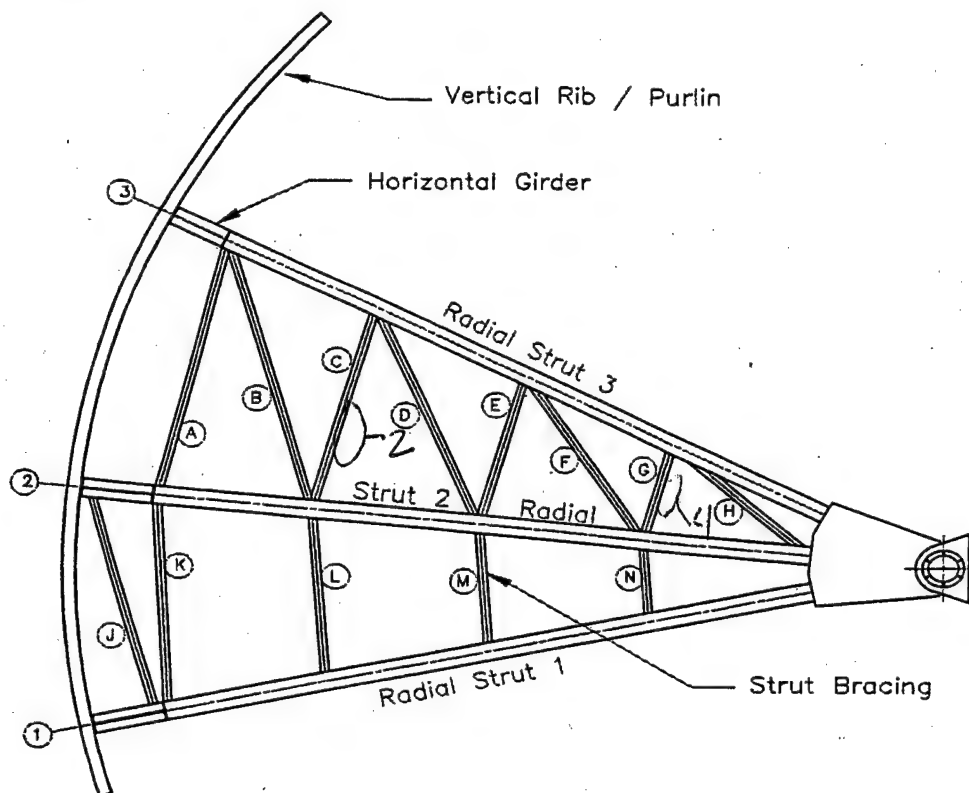
MUCH BETTER CONDITION THAN GRANITE

EVIDENCE OF POST WELD & GRIND

[illegible]



Gate No. 8  
Left Elevation B-B



Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 7/16	15/16		15 3/4	15 3/4	1 1/2	1 7/16
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/8	2 7/16	2 1/2
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16		16 5/8	16 3/4	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace B	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace C	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace D	14 WF 30	13 7/8	13 1/8	5/16		6 3/4	6 13/16	3/8	3/8
Brace E	14 WF 30	13 7/8	13 13/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace F	14 WF 30	13 7/8	13 7/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 13/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace H	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace J	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace L	14 WF 30	13 7/8	13 3/4	5/16		6 3/4	6 7/8	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8

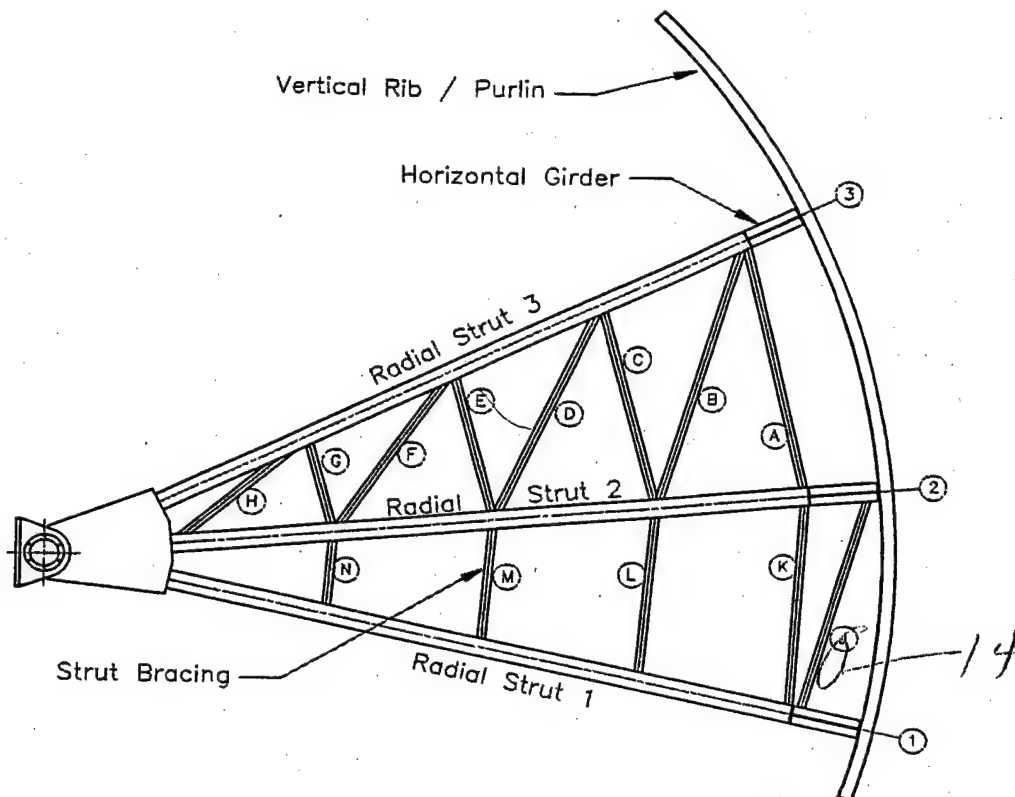
2. Light Rust on Vert Rec. "C"

3. Light Flaky Rust on Diagonal "D"

4. Light Rust Continually Flaking Away

5. OVERALL Pic of LEFT Struts Light Rust & Delam Coatings

Gate No. 8  
Right Elevation  
A-A

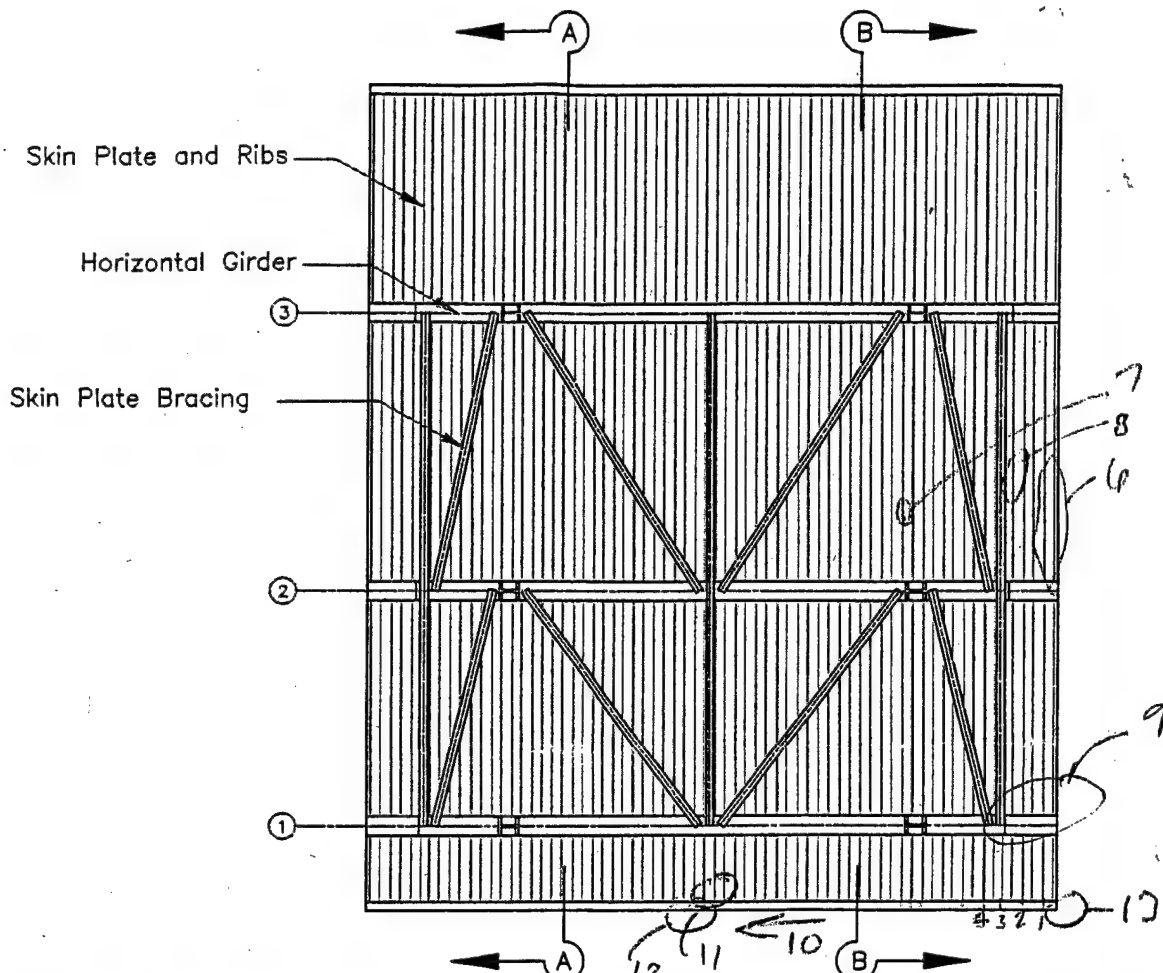


Member	Type	Depth d		Web t <sub>w</sub>		Flange(s)			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Strut 3	14 WF 202	15 5/8	15 7/8	15/16		15 3/4	15 3/4	1 1/2	1 7/16
Strut 2	14 WF 342	17 1/2	17 1/2	1 9/16		16 3/8	16 3/8	2 7/16	2 7/16
Strut 1	14 WF 398	18 1/4	18 1/4	1 13/16		16 5/8	16 5/8	2 13/16	2 13/16
Brace A	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace B	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 13/16	3/8	3/8
Brace D	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace F	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace H	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 7/8	3/8	3/8
Brace J	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace K	14 WF 30	13 7/8	13 7/8	5/16		6 3/4	6 3/4	3/8	3/8
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 3/4	3/8	3/8

14. Typ Detail not gate

15, 16 Gate on 2<sup>nd</sup> skirt from Detail Above

Gate No. 8 Downstream Elevation

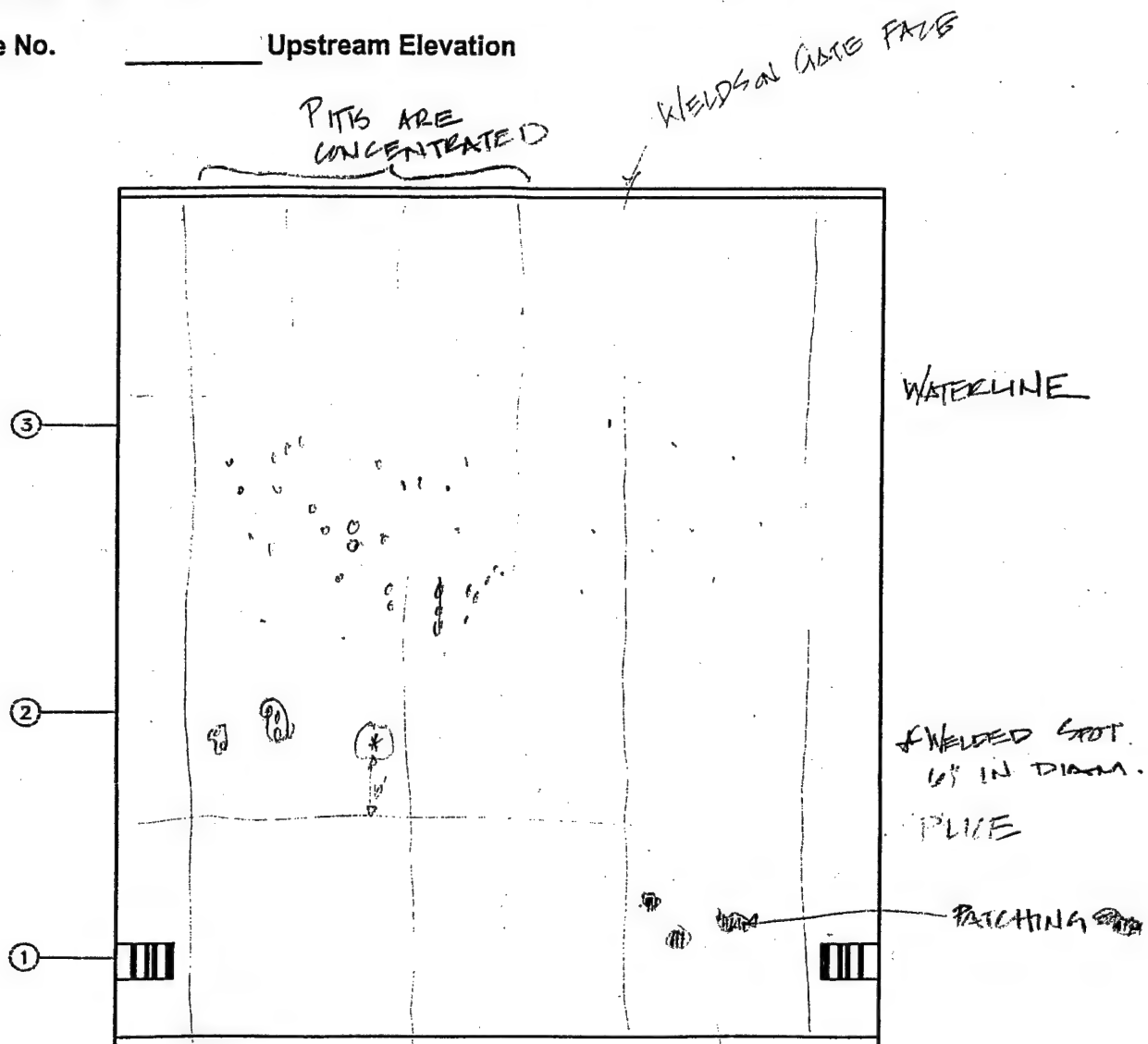


NOTE: ENTIRE GATE is Peeling w/ light RUST. there is evidence of NEW PAINT @ V. GATE FACE PL.

Member	Type	Depth		Web		Flange - End			
		Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)	Plan (in)	Measured (in)
Horiz. Girder 3	PL Girder	49 3/4	49 3/4	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	60 1/2	3/4	3/4	16 1/2	16 1/2	1 1/4	1 1/4
Horiz. Girder 1	PL Girder	60 1/2	60 3/4	1	1 1/16	16 1/2	16 7/16	1 1/4	1 1/4
Purlins	ST 10 WF 31	10 1/2	10 1/2	13/32		8 1/4	8 1/4	5/8	9/16
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	1/4	6 3/4	6 3/4	3/8	3/4

10. FAR LEFT PURLIN MINERAL DEPOSITS & LIGHT RUST.
7. PURLIN WEB BERT.
8. GRINDING MARKS AROUND WELDS (TYP.)
9. BRACE PLTS w/ Debris and evidence of STANDING H<sub>2</sub>O
10. Along Bot SEAL
11. MUCK @ Bot. PLT.
12. LEAK @ CENTER of gate
13. LEAK @ LEFT CORNER

Gate No. \_\_\_\_\_ Upstream Elevation \_\_\_\_\_



- SOME PITS HAVE BEEN FILLED W/ WELD MATERIAL
- RECORDS SHOULD BE REFERENCED
- OTHER PITS ARE EXISTING
- SMALL PITS
- WEAR PLATES LOOK CLEAN

Gate No. 2 Operation and Trunnion Measurements

Racking Measurements: Bottom of Gate and Spillway

LEFT	RIGHT
45"	45"

Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

	LEFT		RIGHT	
	Inside	Outside (pier)	Inside	Outside (pier)
Initial Gate Closed	24/32	14/32	16/32	19/32
Gate Full Open	23/32	16/32	15/32	19/32
Final Gate Closed	23/32	15/32	16/32	19/32

3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				RIGHT			
	No Load Void Dry		Full Load Void Full		No Load Void Dry		Full Load Void Full	
Vertical	+0.0008		+0.0008		0.0000		-0.0010	
US / DS	+0.0020		+0.0315		+0.0010		+0.0250	
Transverse	23/32	15/32	23/32	14/32	16/32	19/32	16/32	19/32
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside

**HDR Engineering, Inc.**  
Corp of Engineers - Walla Walla  
Little Goose Dam

Inspection Team K & N  
Weather RAIN

Date 10/10/00  
Sheet 1 OF 1

**Gate No. 1 Hoist Amperage Readings**

Name Plate Data	REULAND	
Horsepower	15	
Voltage	440/3 PHASE/60 HZ	DESIGN C
Current	19.00	1760 RPM
Type	A000	
Frame	284U	

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
Starting		89.6	84.0	87.6	72.0
Running	Phase A	11.8	6.7	10.9	6.6
	Phase B	12.1	6.4	10.8	6.4
	Phase C	11.8	6.7	10.7	6.6

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

**HDR Engineering, Inc.**  
Corp of Engineers - Walla Walla  
Little Goose Dam

Inspection Team K&N  
Weather RAIN

Date 10/10/00  
Sheet 1 OF 1

Gate No. 2

### Hoist Amperage Readings

Name Plate Data	REULAND	
Horsepower	15	
Voltage	440/3 PHASE/60 HZ	DESIGN C
Current	19.00	1760 RPM
Type	A000	
Frame	284U	

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
Starting		103.0	93.6	92.8	81.6
Running	Phase A	12.1	6.8	10.9	6.7
	Phase B	12.0	6.7	10.8	6.4
	Phase C	12.0	6.8	10.8	6.8

## BEARING NOISE IN MOTOR

Gate No. 3

**Hoist Amperage Readings**

Name Plate Data REULAND

Horsepower 15

Voltage 440/3 PHASE/60 HZ DESIGN C

Current 19.00 1760 RPM

Type A000

Frame 284U

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
Starting		101.0	94.0	96.0	85.6
Running	Phase A	10.8	6.3	10.9	6.4
	Phase B	12.0	6.4	11.1	5.9
	Phase C	12.0	6.4	10.7	6.3

BAD TAPE ON MOTOR LEAD WIRES

HEATER WIRES FRAYED



Date 10/10/00  
Sheet 1 OF 1

### Hoist Amperage Readings

Name Plate Data	REULAND	
Horsepower	15	
Voltage	440/3 PHASE/60 HZ	DESIGN C
Current	19.00	1760 RPM
Type	A000	
Frame	284U	

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
Starting		93.0	88.0	84.8	78.0
Running	Phase A	12.3	6.0	11.6	6.2
	Phase B	12.4	6.2	11.6	6.3
	Phase C	12.5	6.2	11.6	6.2

Date 10/10/00  
Sheet 1 OF 1

ADJUSTED BARKE UNIT

Date 10/17/00  
Sheet 1 OF 1

### Hoist Amperage Readings

Frame 284U

## MOTOR BEARINGS GONE

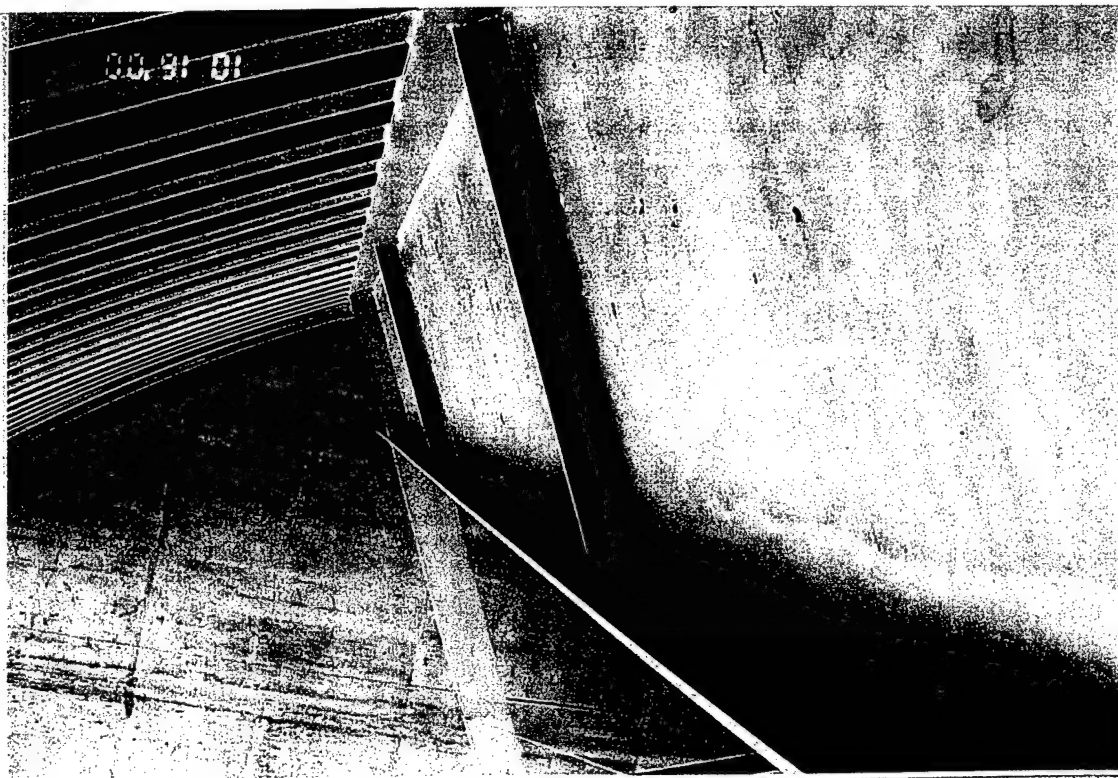
Date 10/10/00  
Sheet 1 OF 1

### Hoist Amperage Readings

Name Plate Data	REULAND	
Horsepower	15	
Voltage	440/3 PHASE/60 HZ	DESIGN C
Current	19.00	1760 RPM
Type	A000	
Frame	284U	

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
Starting		95.2	84.0	84.0	74.0
Running	Phase A	11.8	5.8	12.2	6.4
	Phase B	10.8	5.5	12.0	6.3
	Phase C	11.0	5.7	11.8	6.3

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

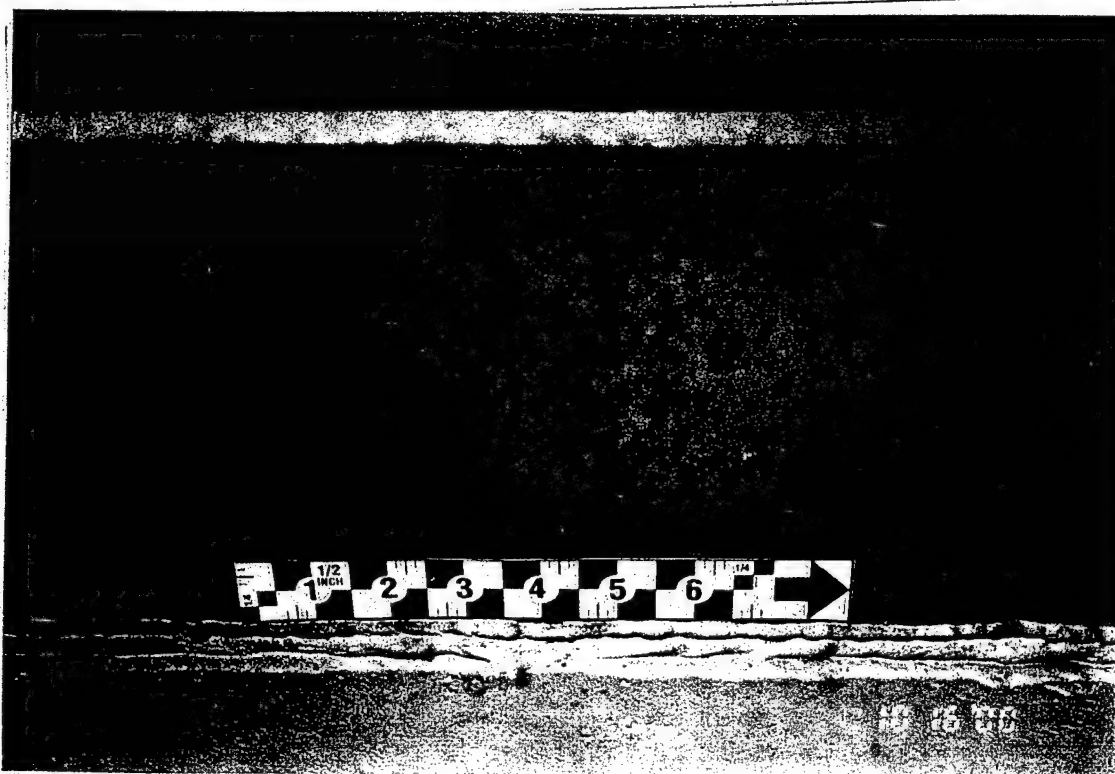


Little  
Goose  
Dam

**Gate 1**  
Top horizontal girder looking toward  
right frame, typical.

10/16/00

1-1



Little  
Goose  
Dam

**Gate 1**  
Downstream surface of skin plate.  
Light corrosion, typical.

10/16/00

1-2



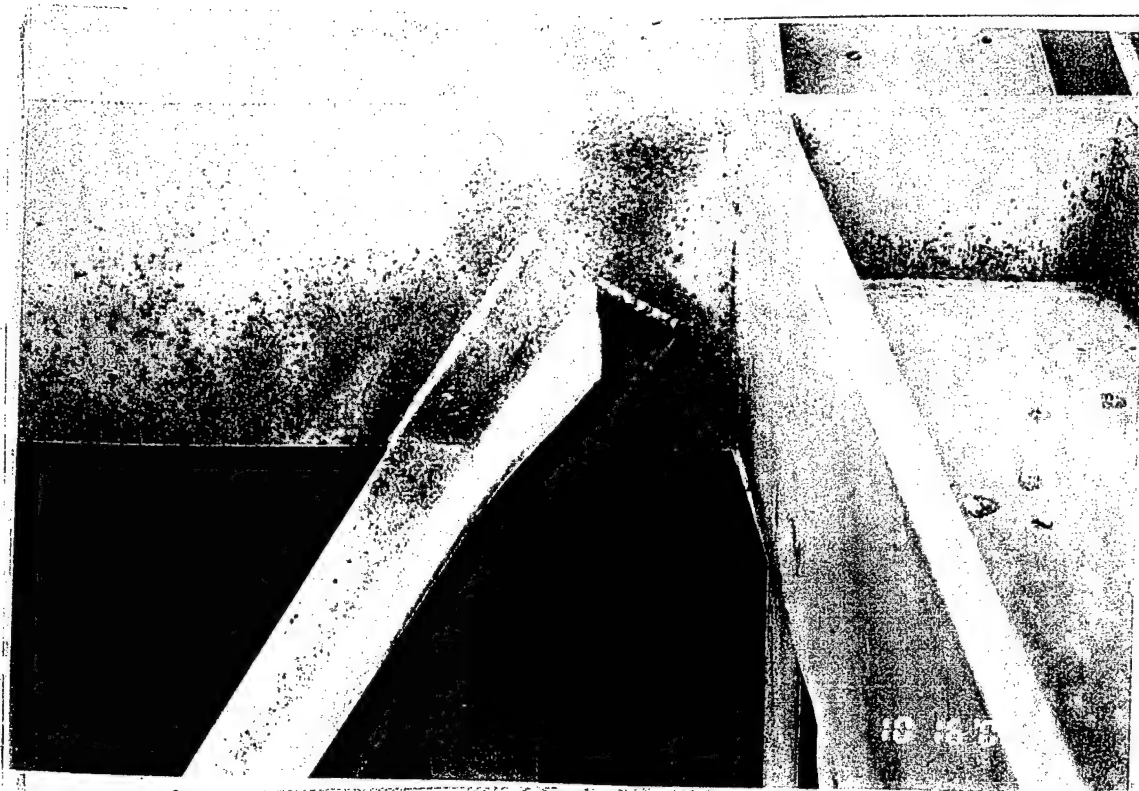
Little  
Goose  
Dam

10/16/00

1-3

#### Gate 1

Skin plate at center of gate, 5' above  
top horizontal girder. Apparent  
previous weld and grind repair.



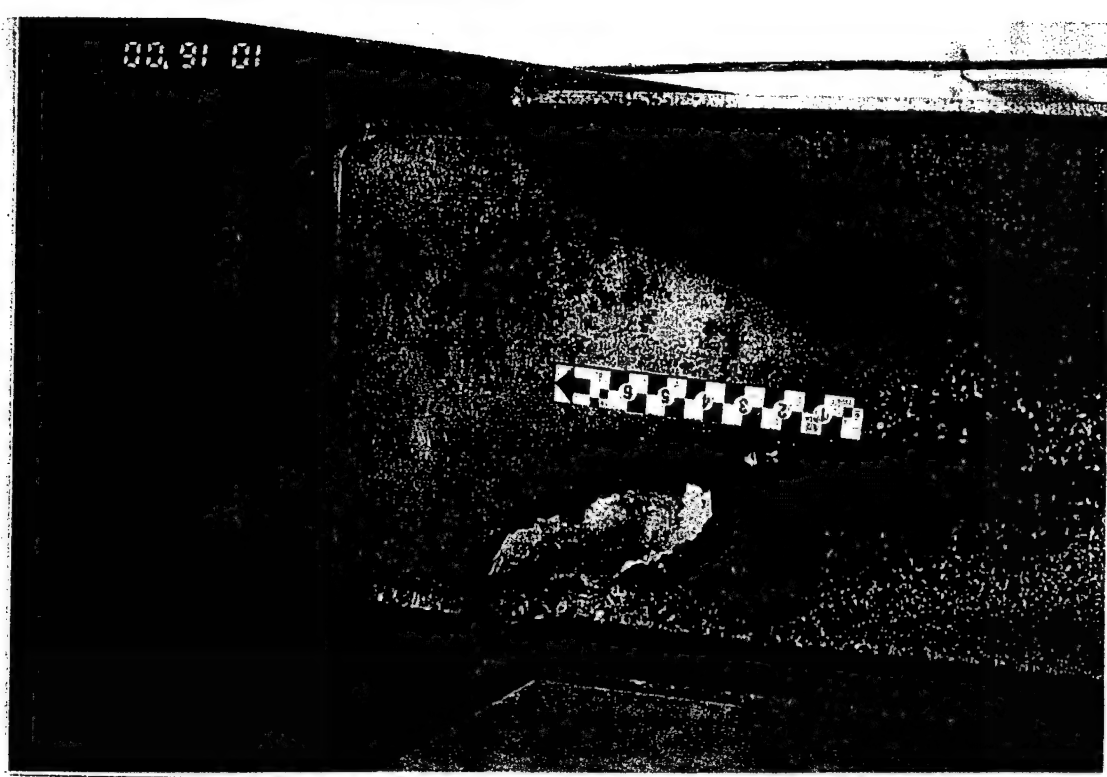
Little  
Goose  
Dam

10/16/00

1-4

#### Gate 1

Top horizontal girder, downstream  
flange at connection to left top radial  
strut. Light corrosion.



Little  
Goose  
Dam

10/16/00

1-5

**Gate 1**

Left frame, brace C. Light corrosion  
beneath connection to top radial strut



Little  
Goose  
Dam

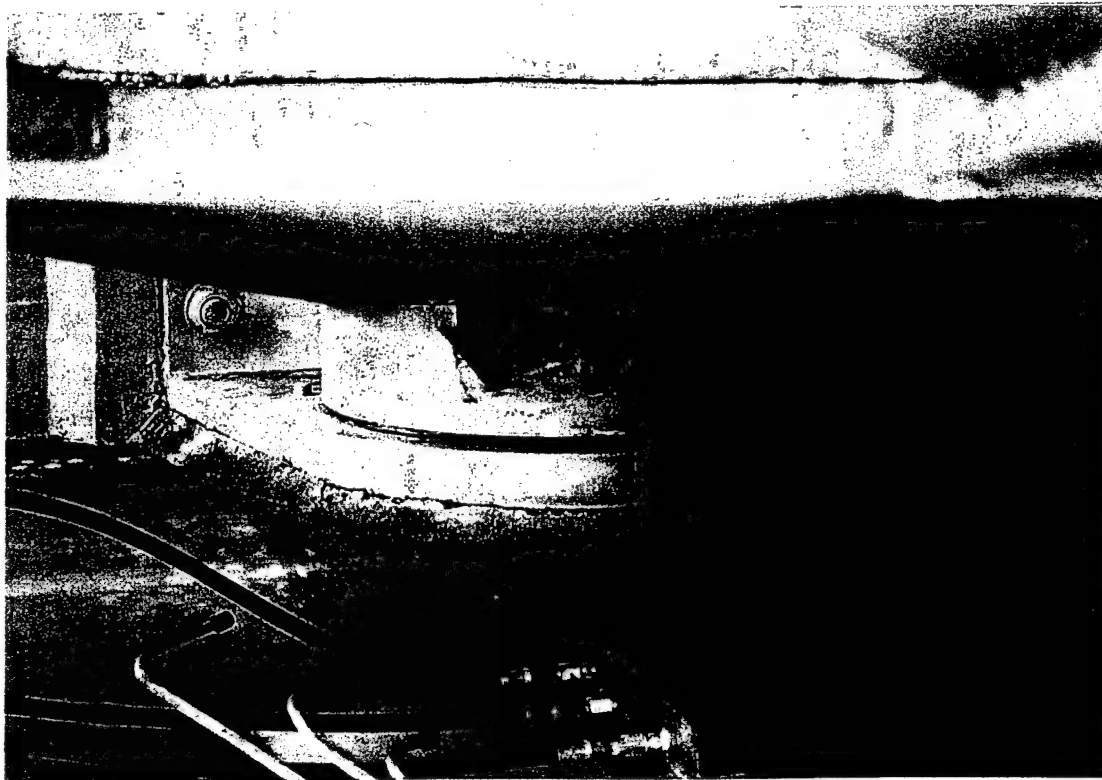
10/16/00

1-6

**Gate 1**

Right trunnion block. Light cracking  
in concrete.



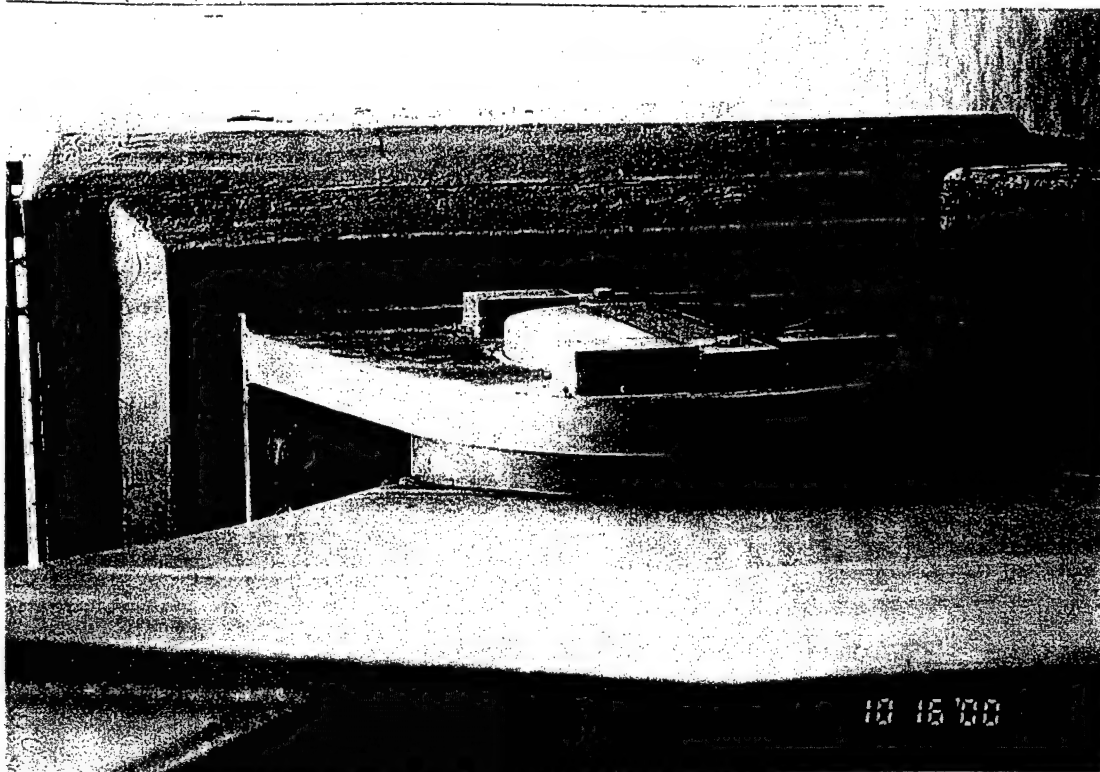


Little  
Goose  
Dam

Gate 1  
Outside of left trunnion and trunnion  
yoke, typical.

10/16/00

1-7



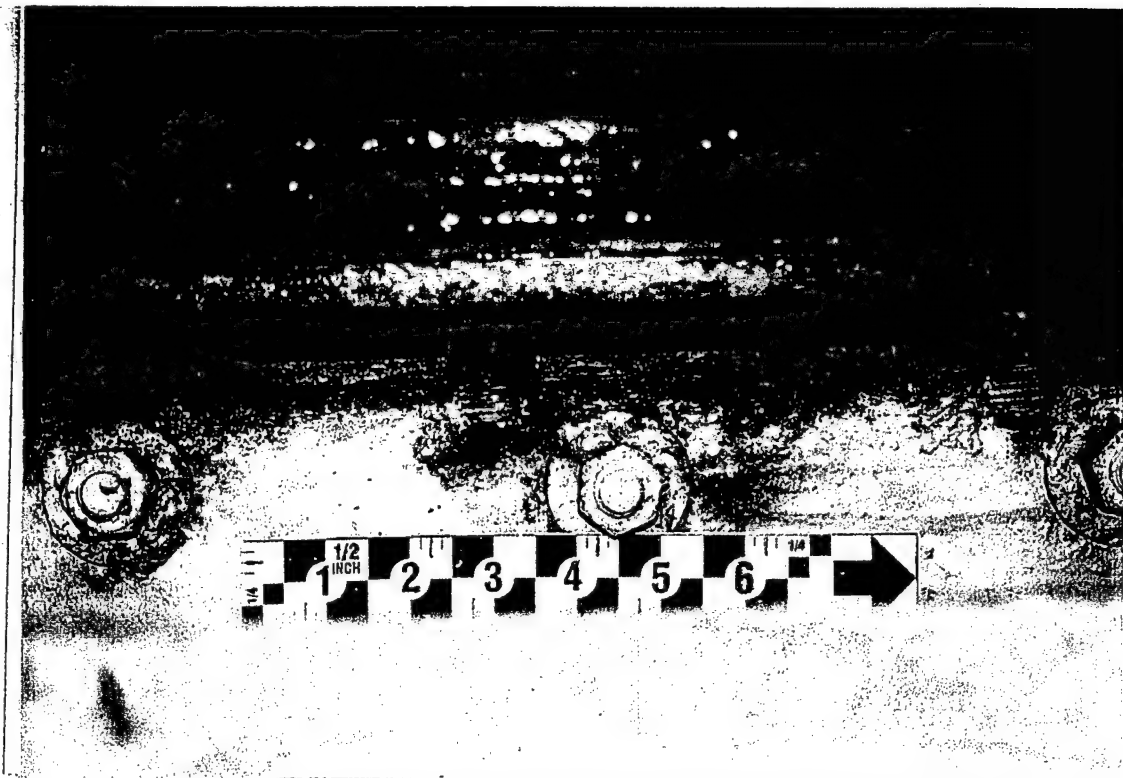
Little  
Goose  
Dam

Gate 1  
Inside of left trunnion and yoke,  
typical.

10/16/00

1-8





Little  
Goose  
Dam

10/16/00

1-9

**Gate 1**

Side seal, typical. Light to moderate corrosion on skin plate, side seal angle, nuts and bolts.



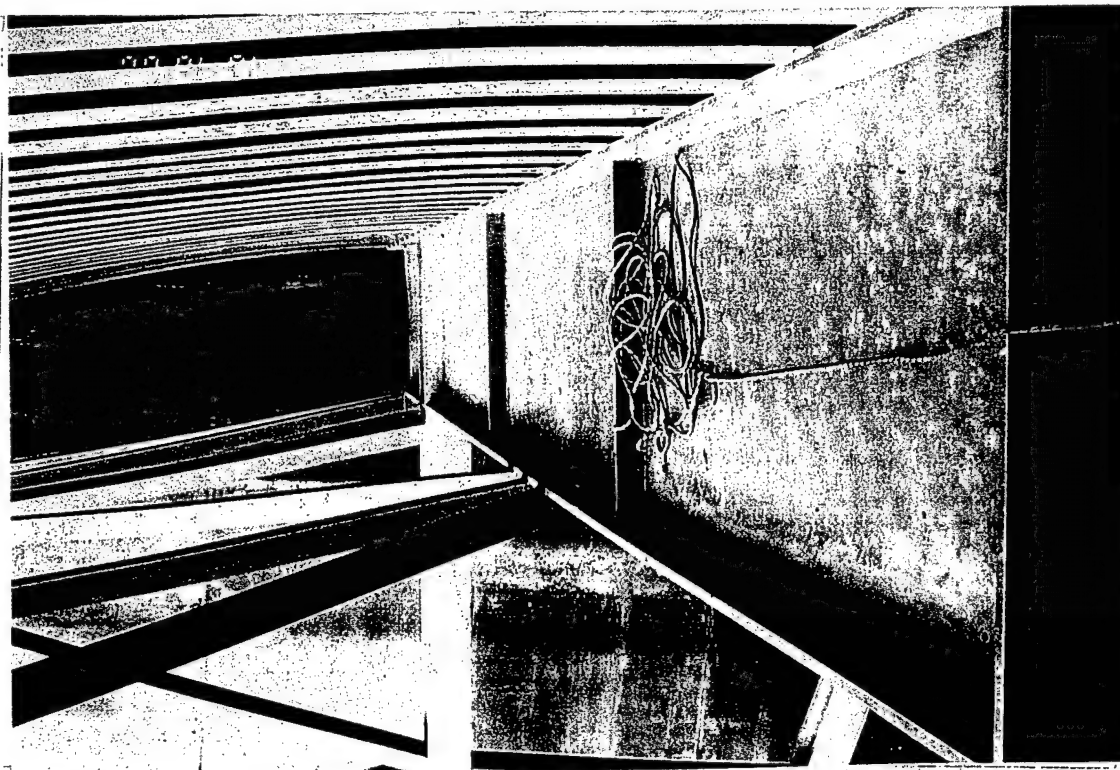
Little  
Goose  
Dam

10/16/00

1-10

**Gate 1**

Side seal, typical. Light to moderate corrosion on skin plate, side seal angle, nuts and bolts.



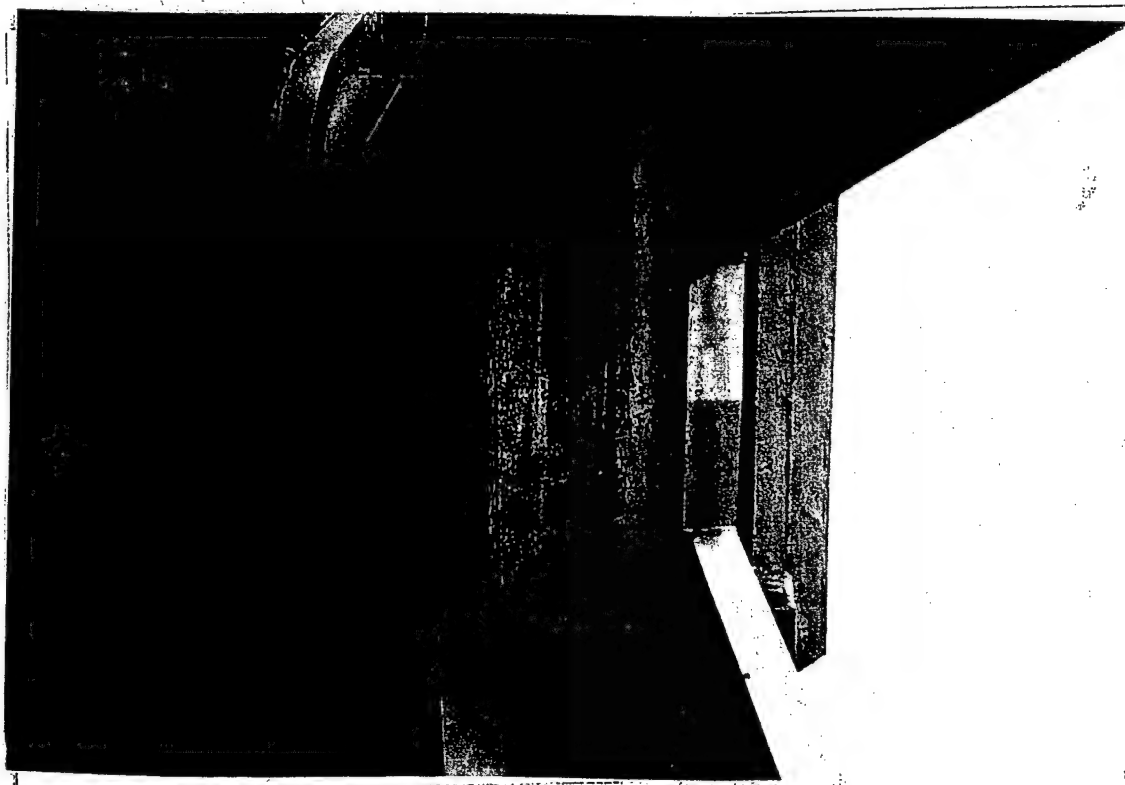
Little  
Goose  
Dam

10/16/00

1-11

#### Gate 1

Middle horizontal girder looking  
toward right frame, typical.



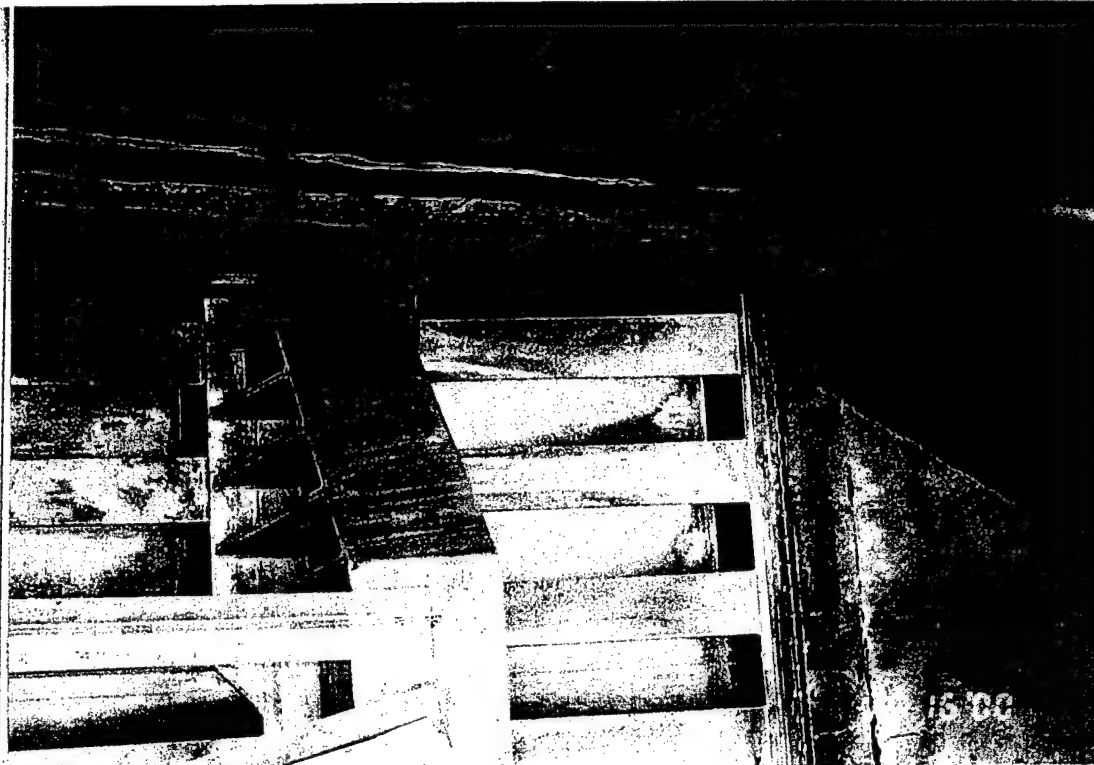
Little  
Goose  
Dam

10/16/00

1-12

#### Gate 1

Closure plate inside left trunnion.  
Light corrosion.

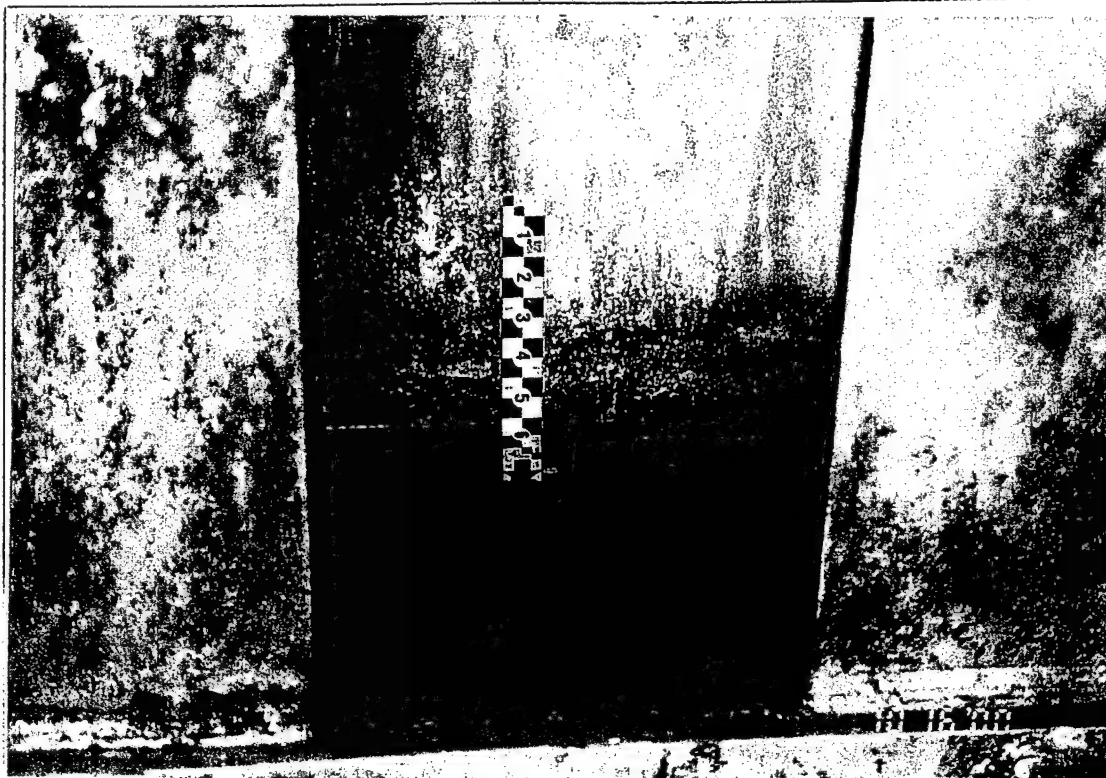


Little  
Goose  
Dam

Gate 1  
Corner leak at bottom left side of  
gate.

10/16/00

1-13



Little  
Goose  
Dam

Gate 1  
Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate. Typical.

10/16/00

1-14



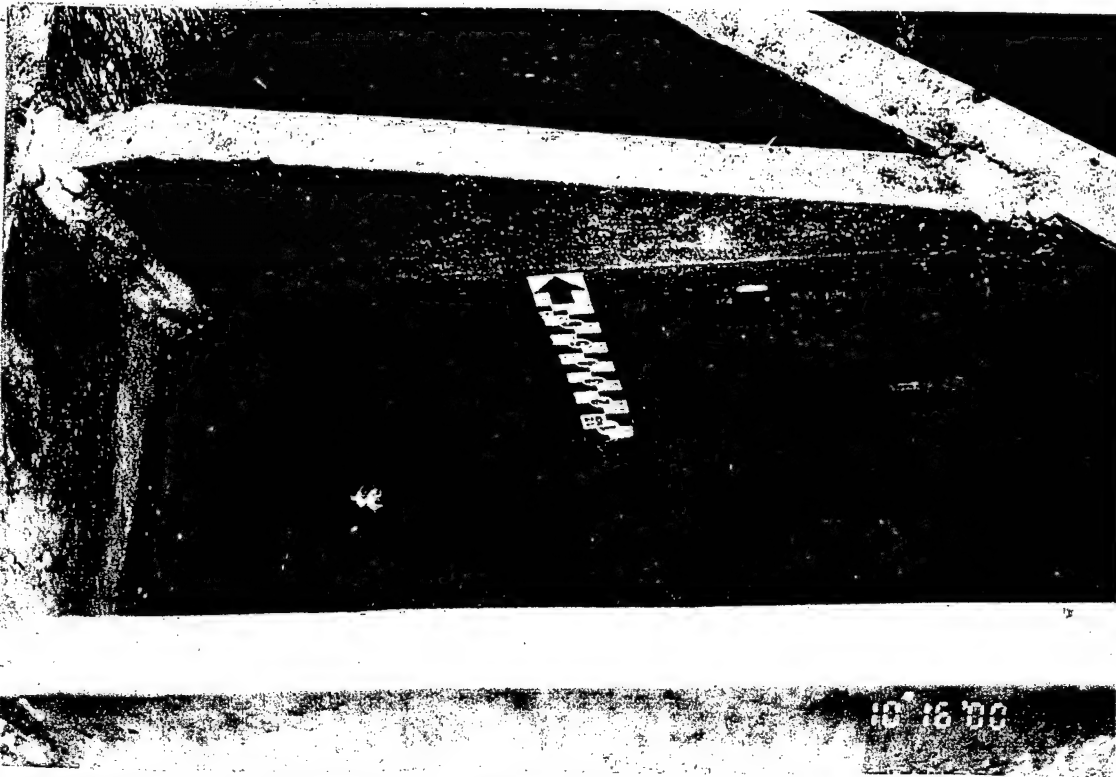
Little  
Goose  
Dam

10/16/00

1-15

#### Gate 1

Bottom horiz. girder. Standing  
water, no drainage between multiple  
stiffeners, typical.



Little  
Goose  
Dam

10/16/00

1-16

#### Gate 1

Bottom horiz. girder. Standing  
water, no drainage between multiple  
stiffeners, typical.



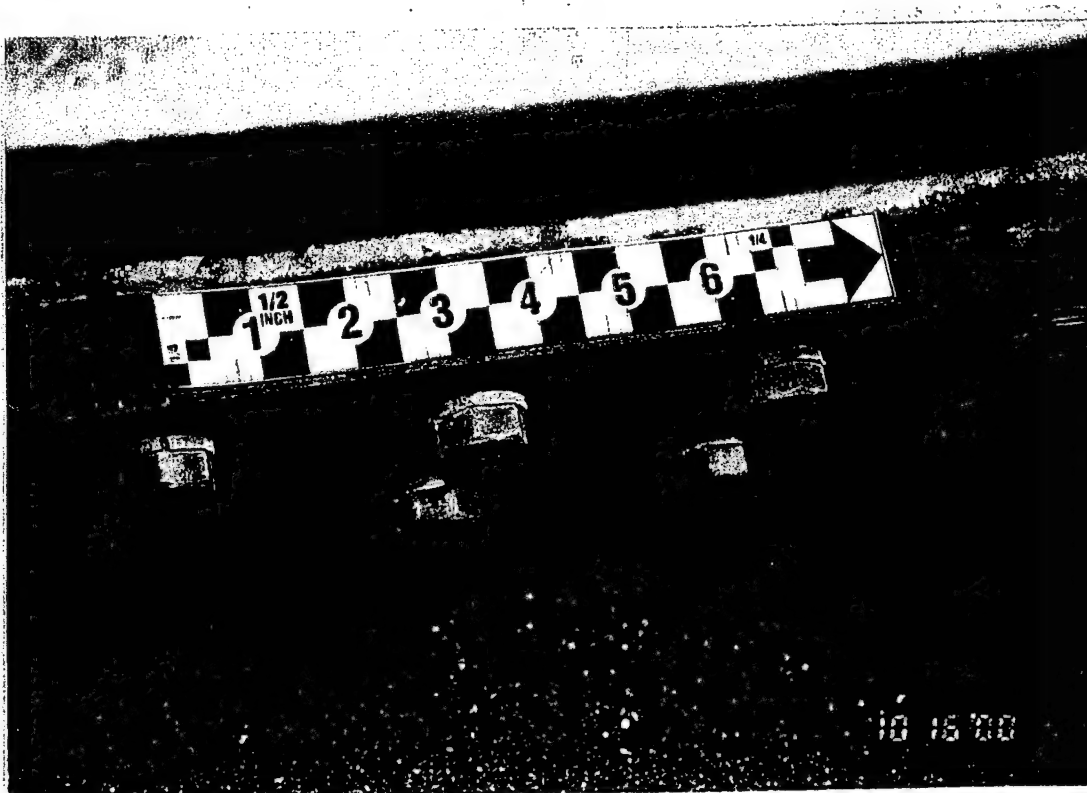
Little  
Goose  
Dam

10/16/00

1-17

#### Gate 1

Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate. Typical.



Little  
Goose  
Dam

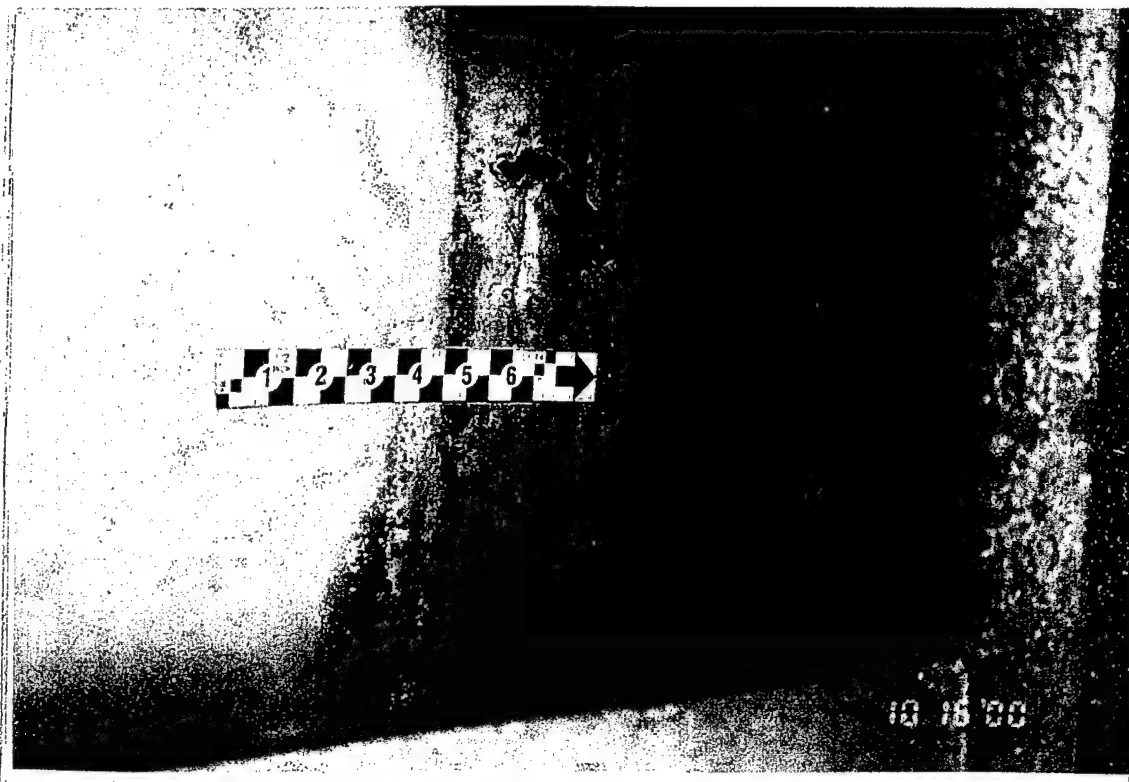
10/16/00

1-18

#### Gate 1

Bottom seal keeper plate and  
embedded bottom seal plate, typical.





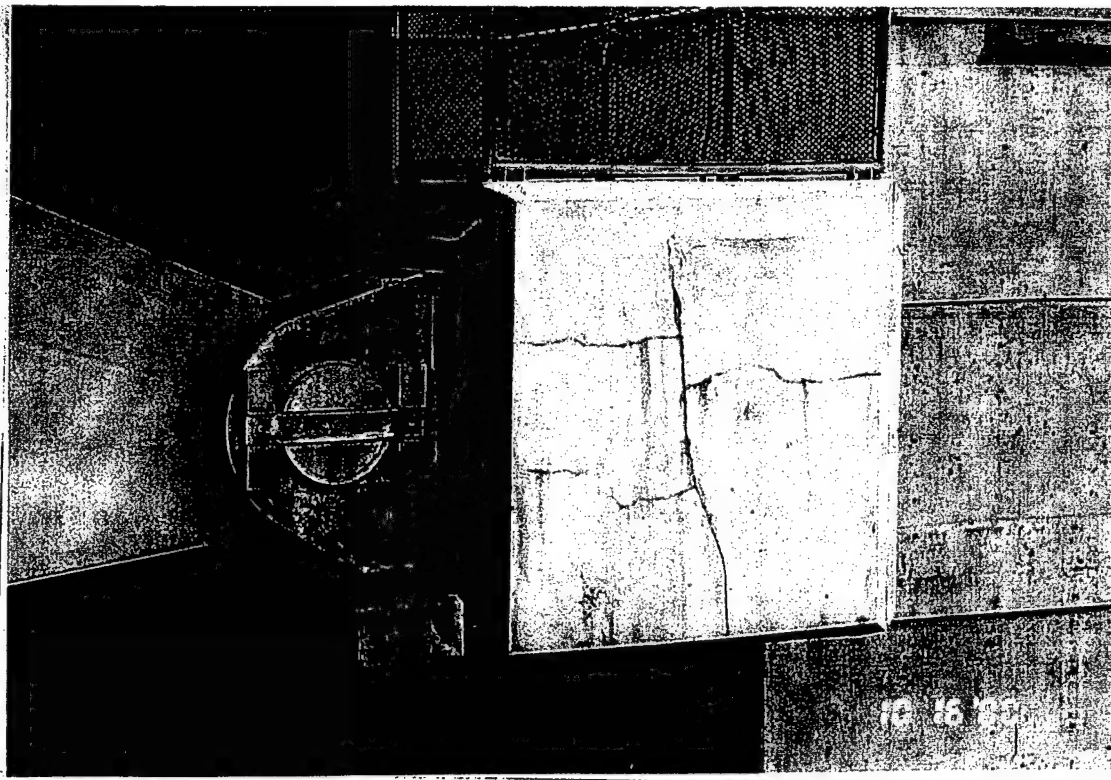
Little  
Goose  
Dam  
10/16/00  
1-19

**Gate 1**  
Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate. Typical.



Little  
Goose  
Dam  
10/16/00  
1-20

**Gate 1**  
Bottom of bottom horizontal girder  
at stiffeners for bottom left radial  
strut. Light to moderate corrosion  
due to horiz. girder drain hole above.

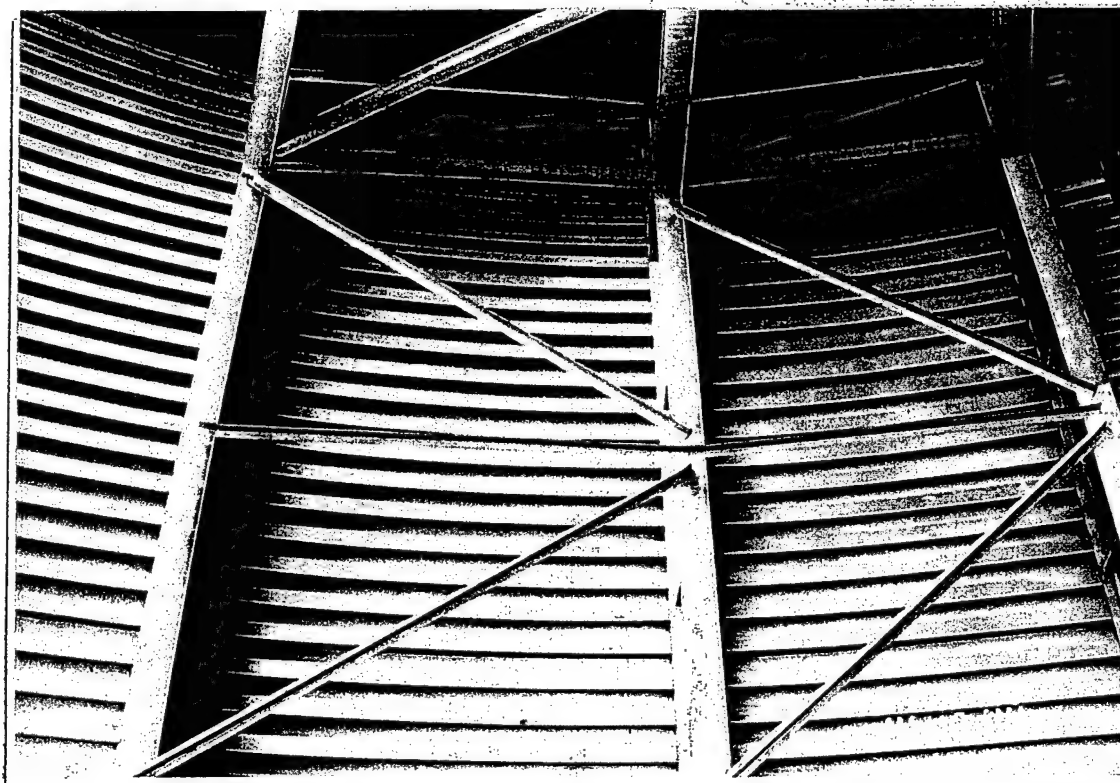


Little  
Goose  
Dam

**Gate 1**  
Left trunnion block. Light cracking  
in concrete.

10/16/00

1-21

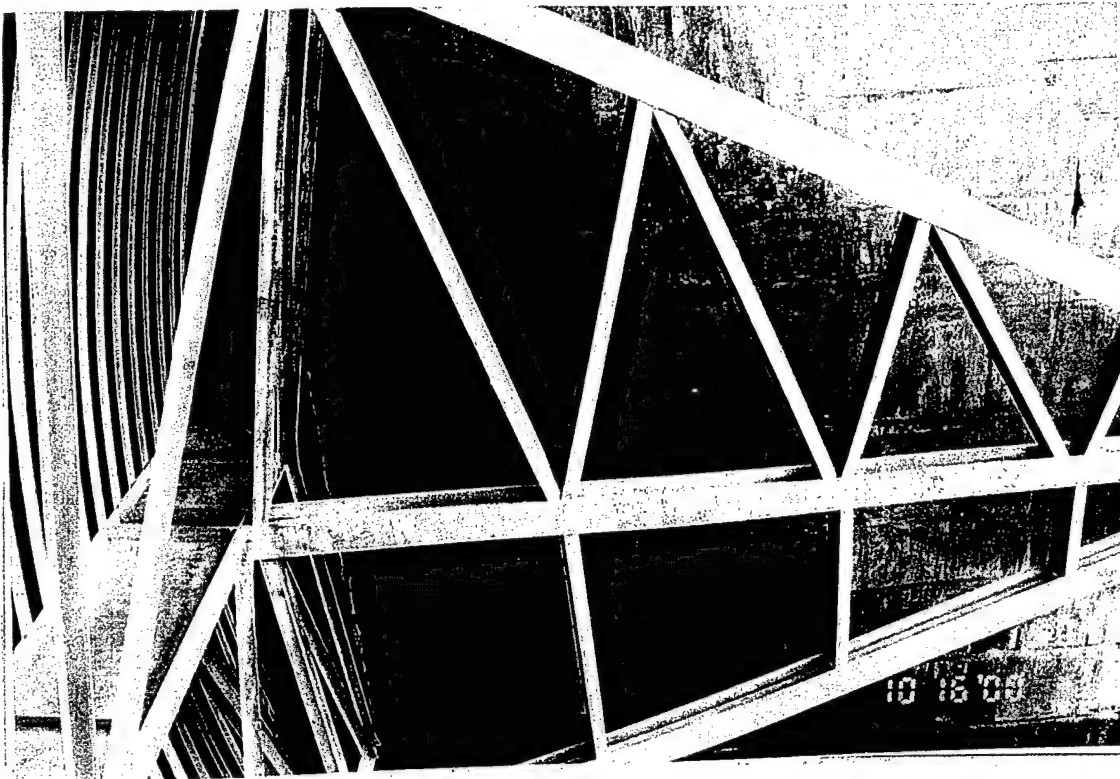


Little  
Goose  
Dam

**Gate 1**  
Gate face, typical.

10/16/00

1-22

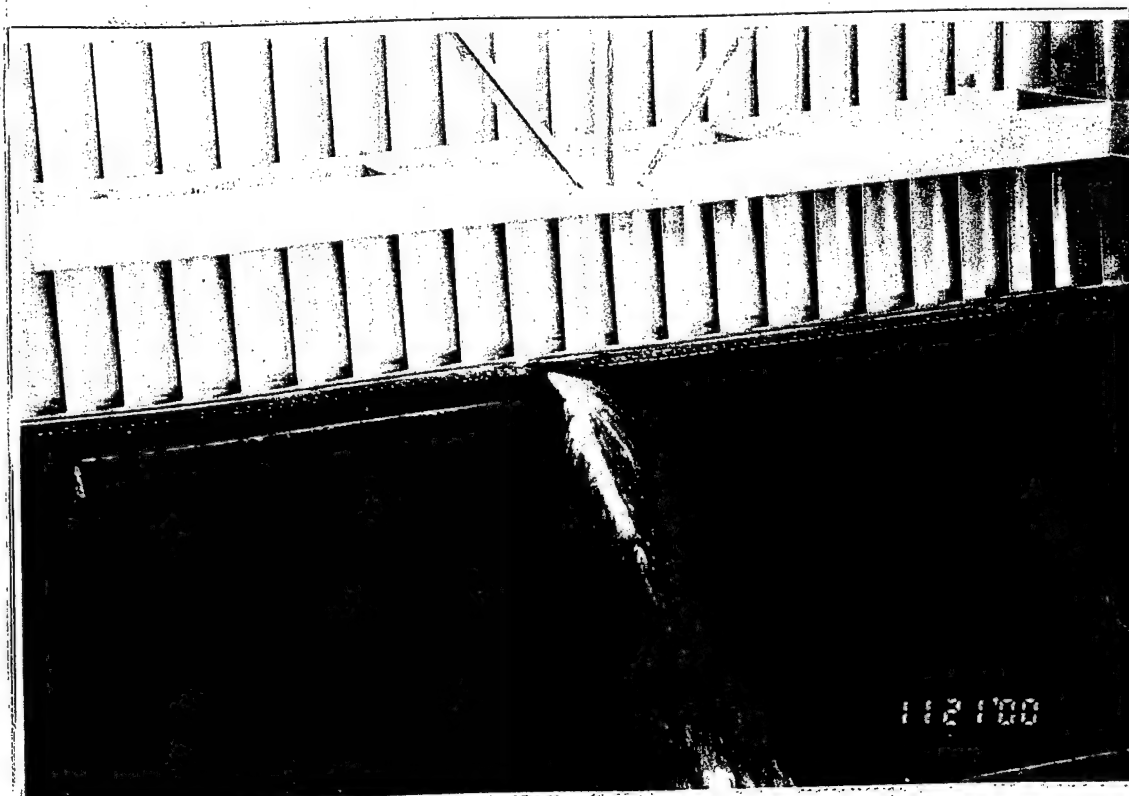


Little  
Goose  
Dam

Gate 1  
Left frame, typical.

10/16/00

1-23



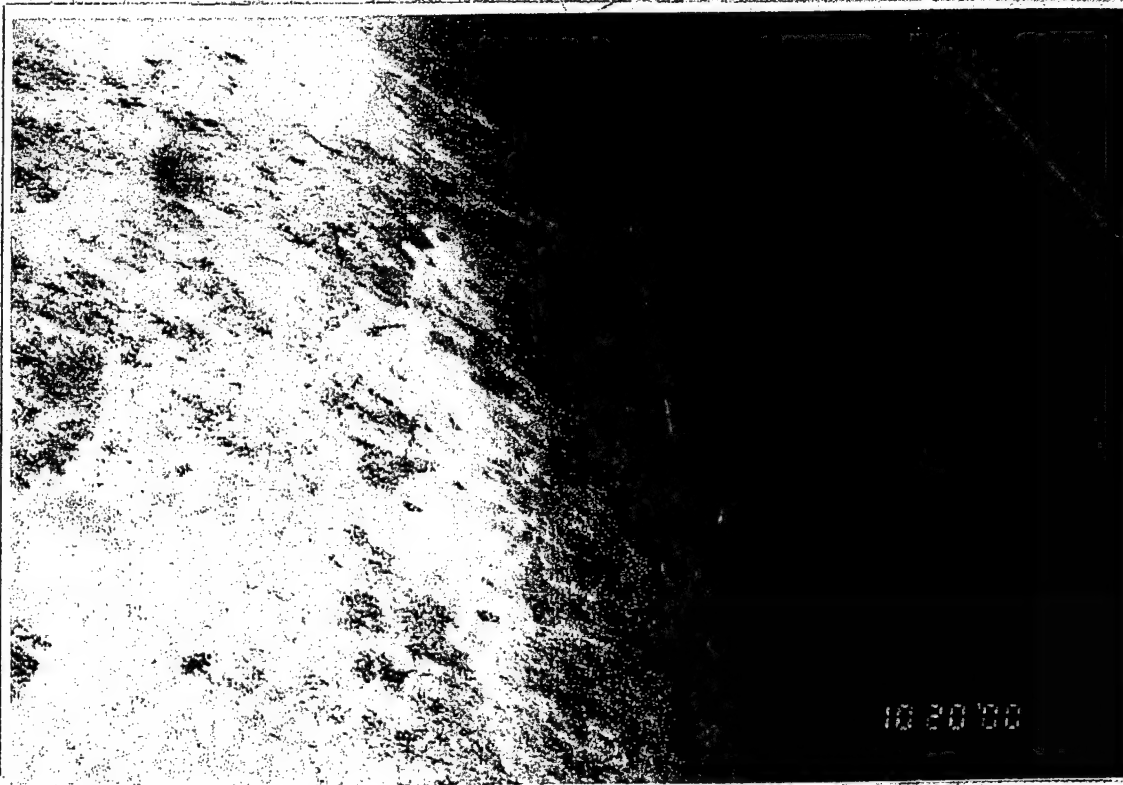
Little  
Goose  
Dam

Gate 1  
Leak at center construction joint in  
spillway monolith.

11/21/00

1-24



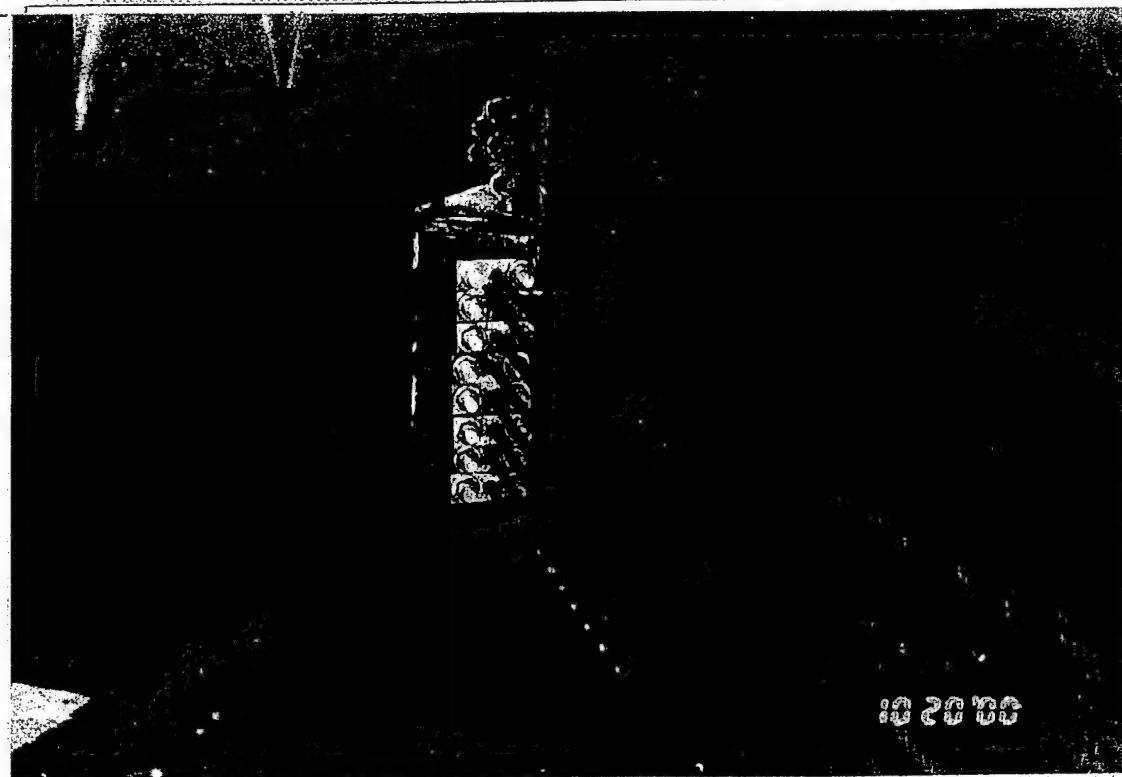


Little  
Goose  
Dam

Gate 1  
Typical condition of skin plate.  
Scattered pitting.

10/20/00

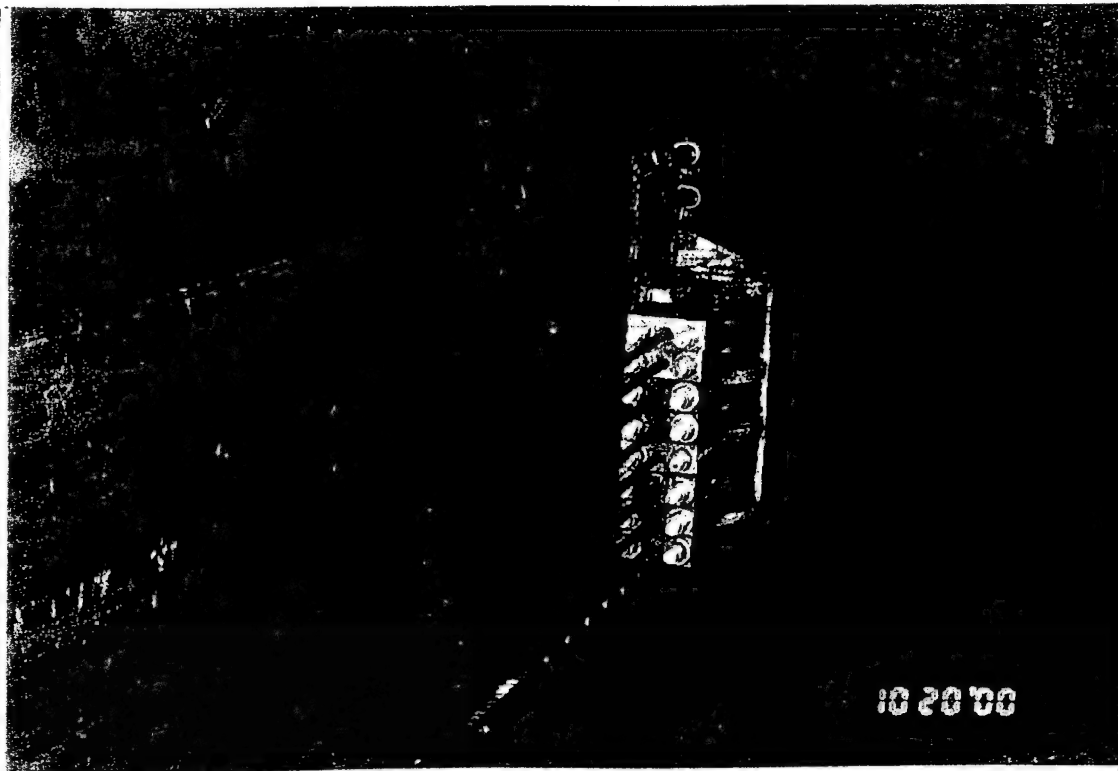
1-25



Little  
Goose  
Dam

Gate 1  
Top of hoist connection. Note:  
Good condition of stainless steel U-  
bolts and socket blocks.

10/20/00



Little  
Goose  
Dam

10/20/00

1-27

**Gate 1**

Top of hoist connection. Note:  
Good condition of stainless steel U-  
bolts and socket blocks.



Little  
Goose  
Dam

10/20/00

1-28

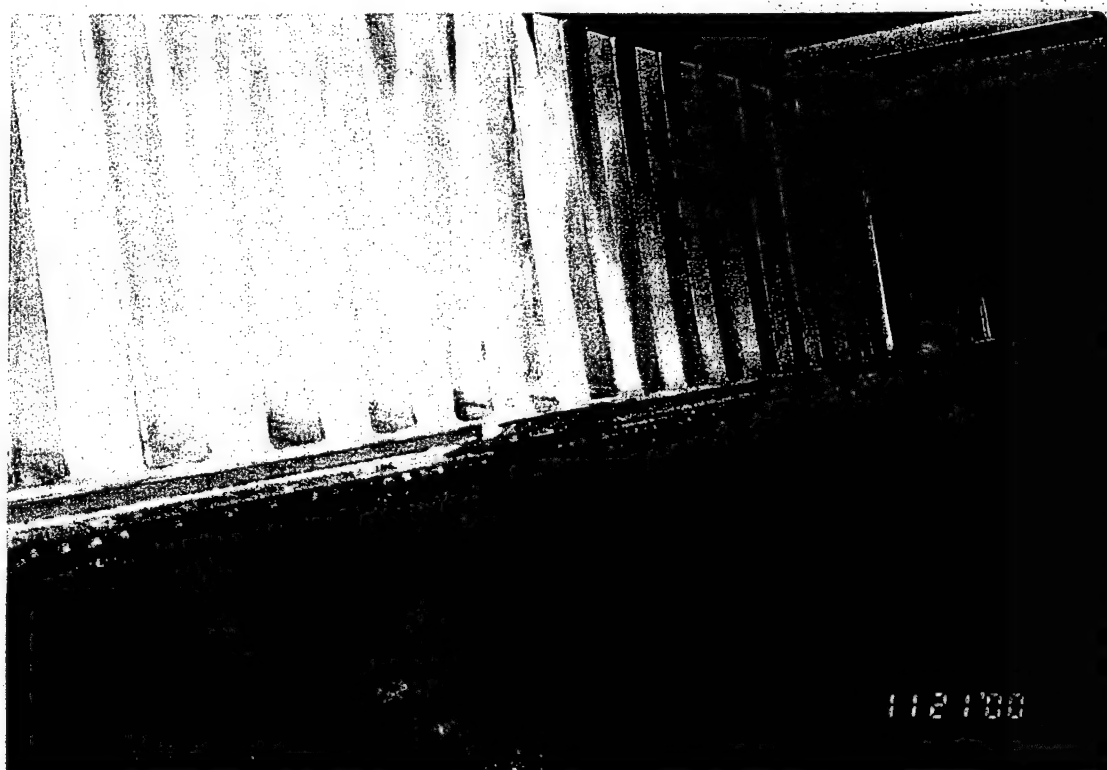
**Gate 1**

Skin plate pitting, typical.



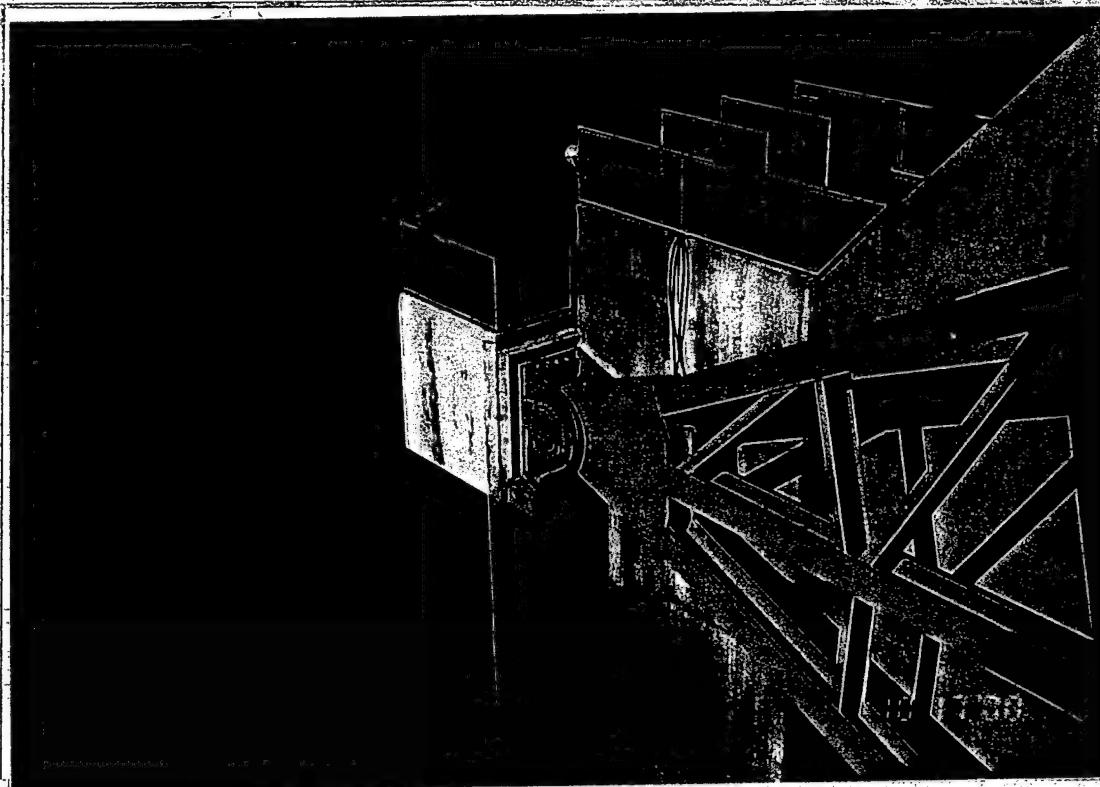
Little  
Goose  
Dam  
10/20/00  
1-29

**Gate 1**  
Bottom of right side of gate at 3'  
open. Note: Heavy falling water due  
to stop log leakage precludes  
inspection of hoist connections.



Little  
Goose  
Dam  
10/20/00  
1-30

**Gate 1**  
Bottom of left side of gate at 3'  
open. Note: Heavy falling water due to  
stop log leakage precludes inspection  
of hoist connections.



Little  
Goose  
Dam

Gate 2  
Right frame, typical.

10/17/00

2-1

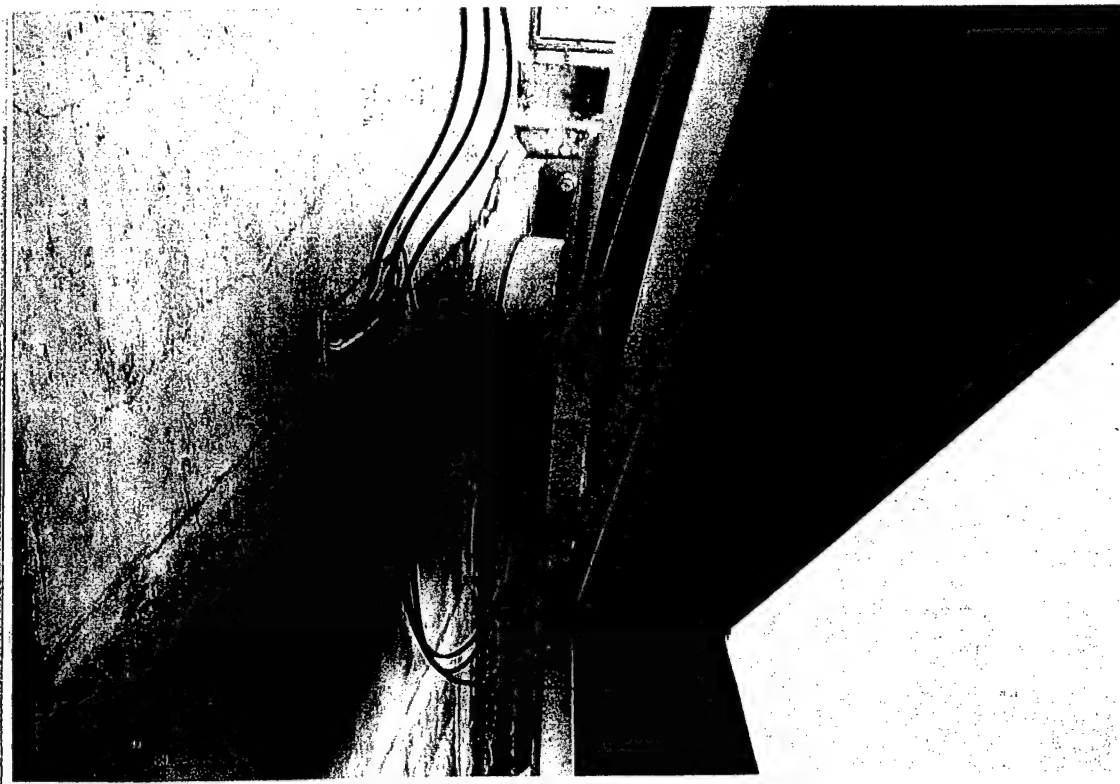


Little  
Goose  
Dam

Gate 2  
Top of top horizontal girder looking  
towards right frame, typical.

10/17/00

2-2

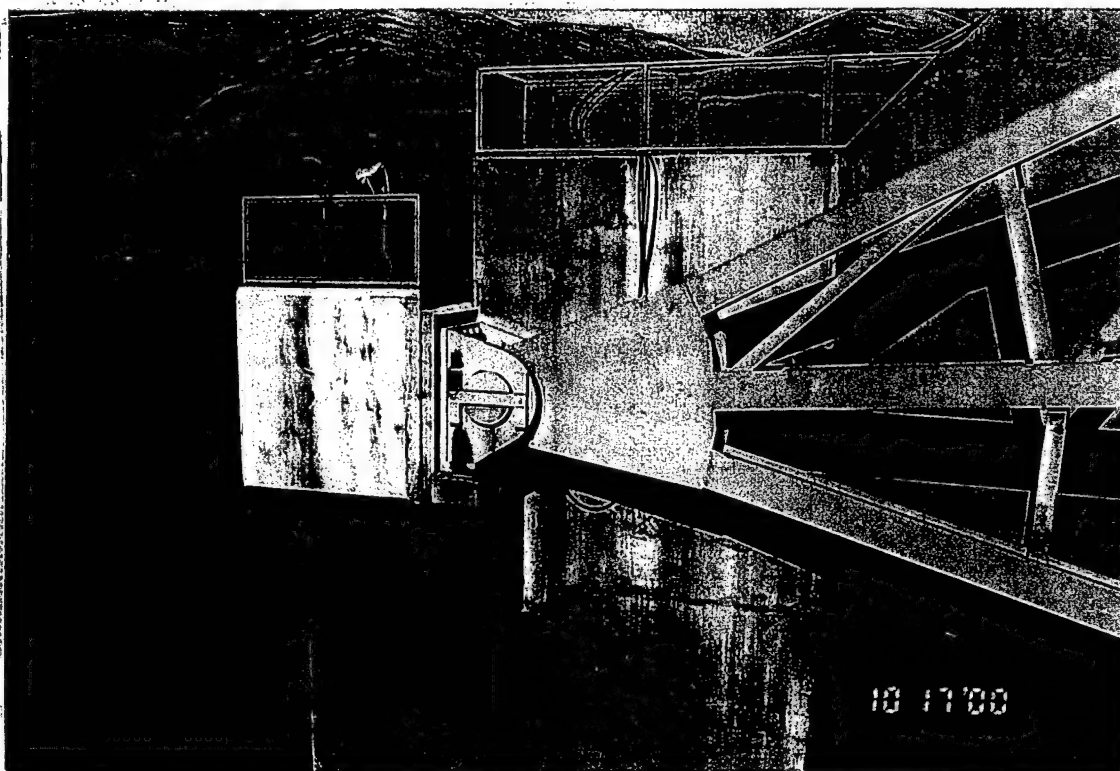


Little  
Goose  
Dam

10/17/00

2-3

Gate 2  
Outside of left trunnion and yoke,  
typical.

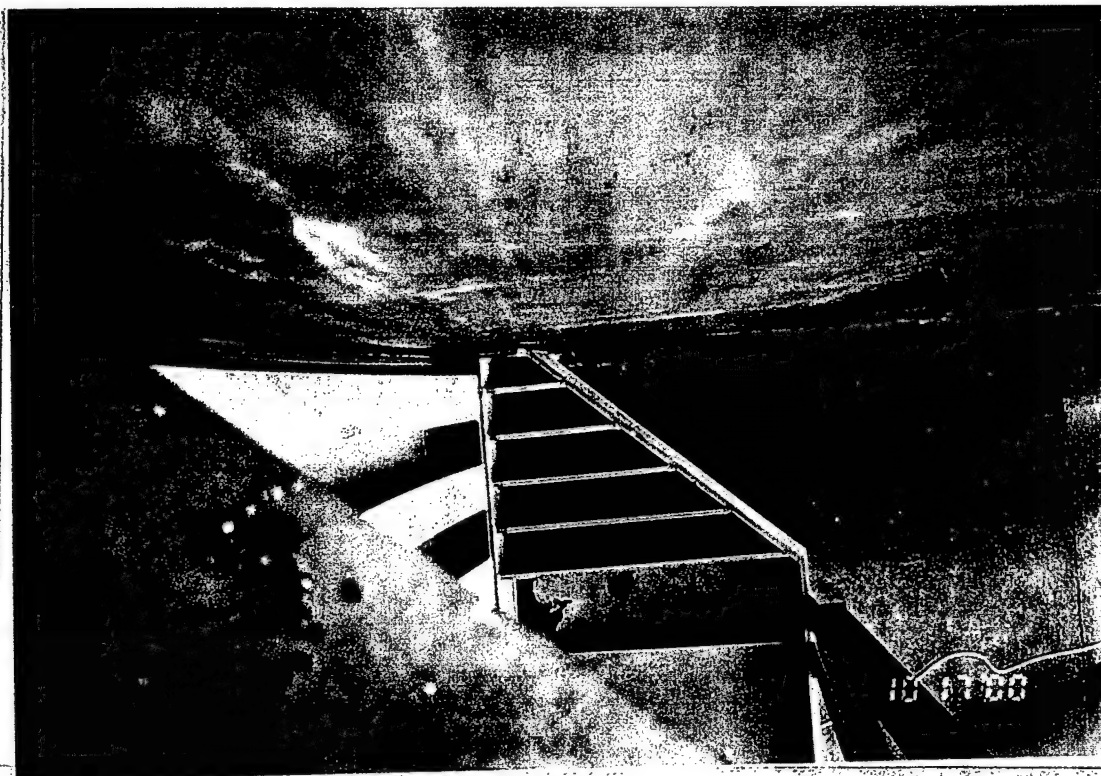


Little  
Goose  
Dam

10/17/00

2-4

Gate 2  
Right trunnion and trunnion block,  
typical.



Little  
Goose  
Dam

10/17/00

2-5

**Gate 2**

Bottom horizontal girder, left end.  
Standing water, no drainage between  
multiple stiffeners, typical.



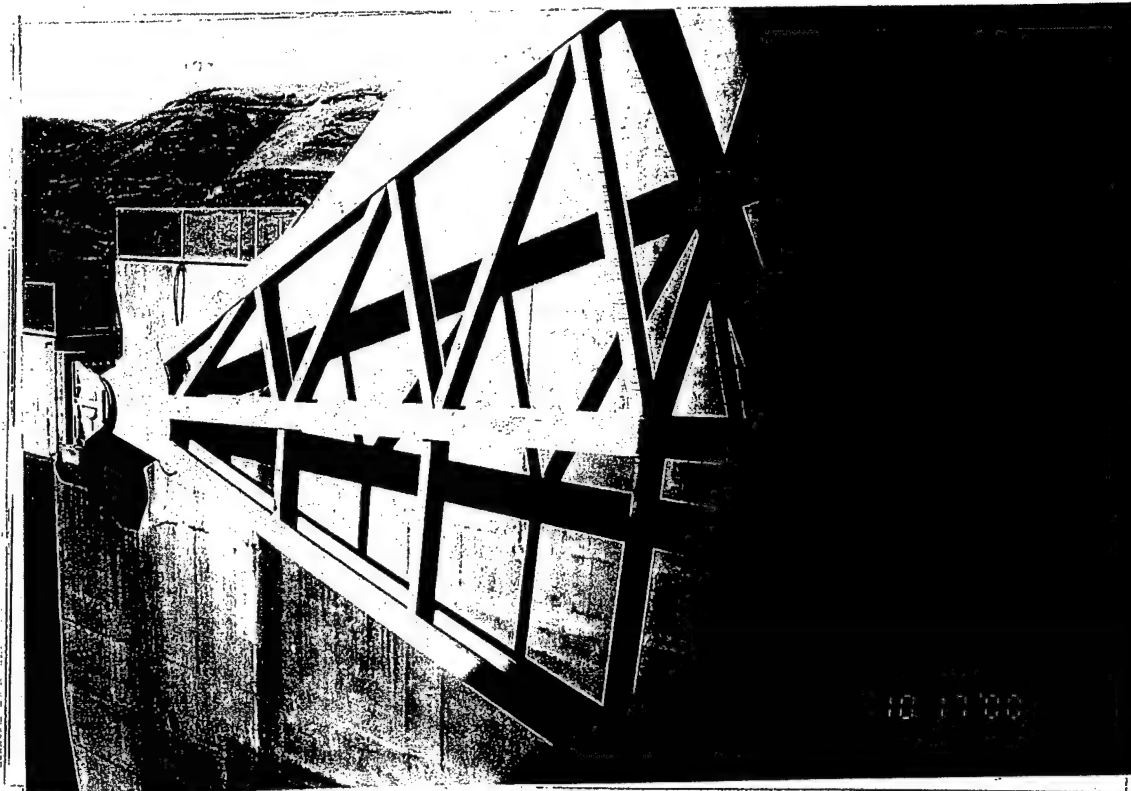
Little  
Goose  
Dam

10/17/00

2-6

**Gate 2**

Side seal leak, right end of bottom  
horizontal girder.

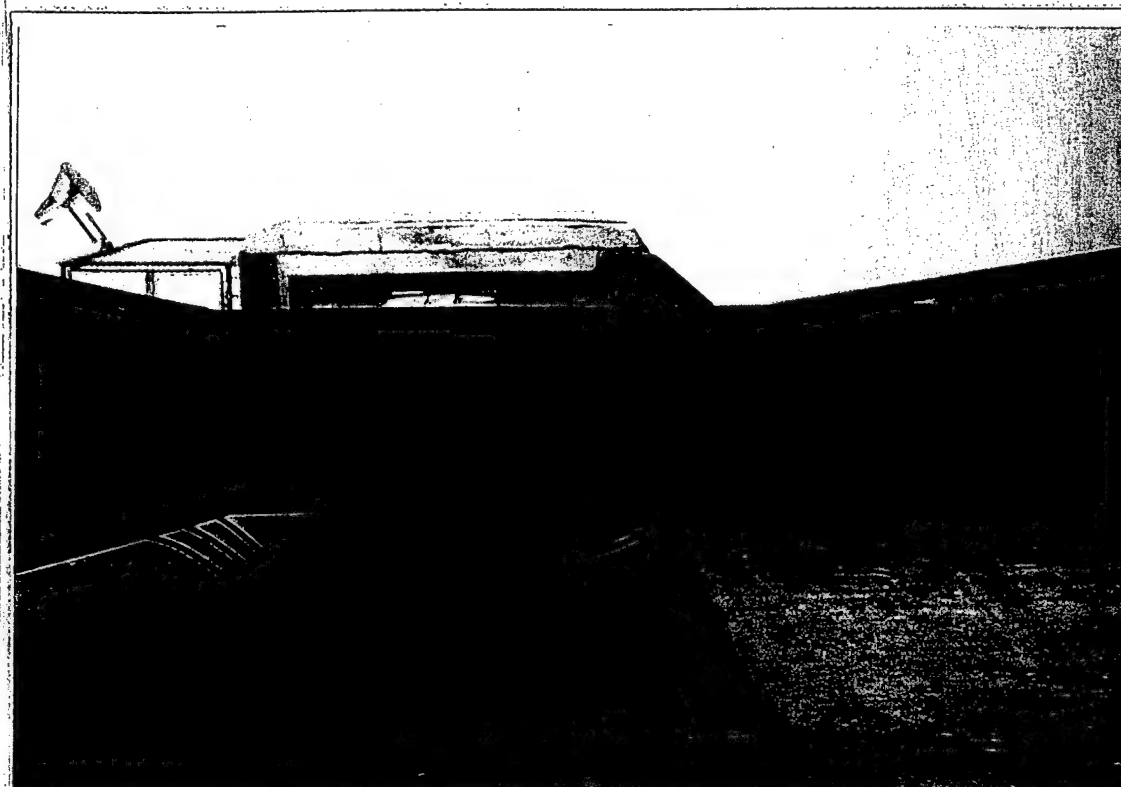


Little  
Goose  
Dam

10/17/00

2-7

Gate 2  
Right frame, typical.



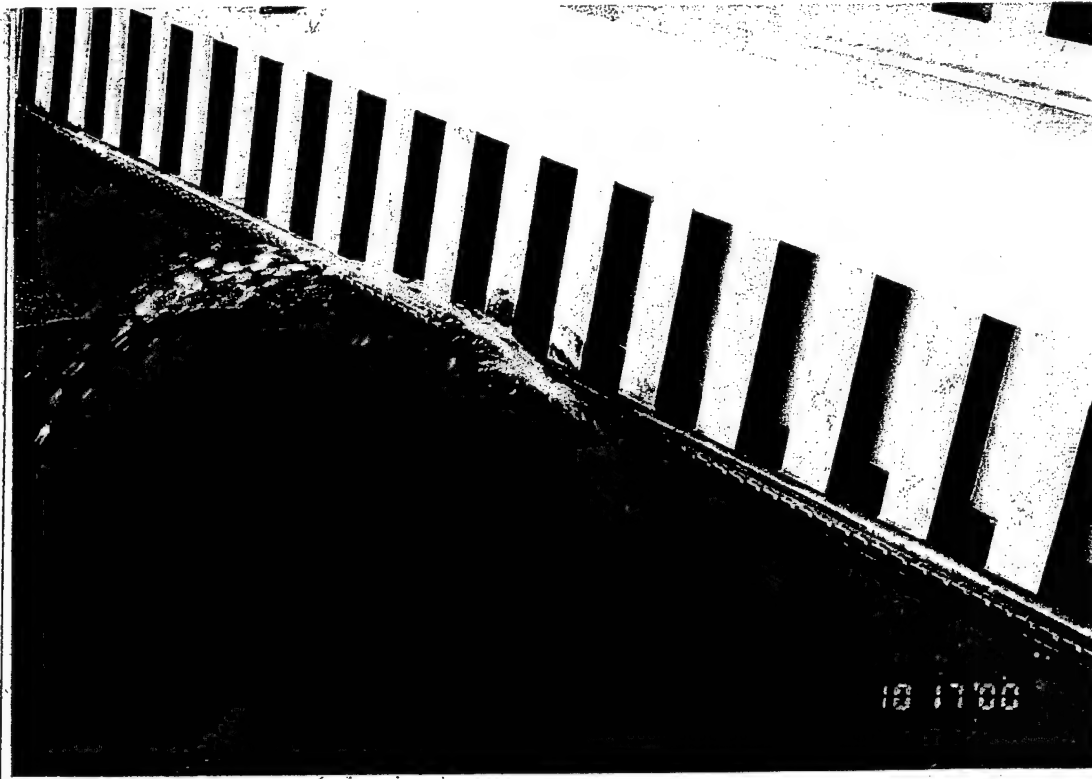
Little  
Goose  
Dam

10/17/00

2-8

Gate 2  
Brace H, left frame. Light corrosion  
on web.



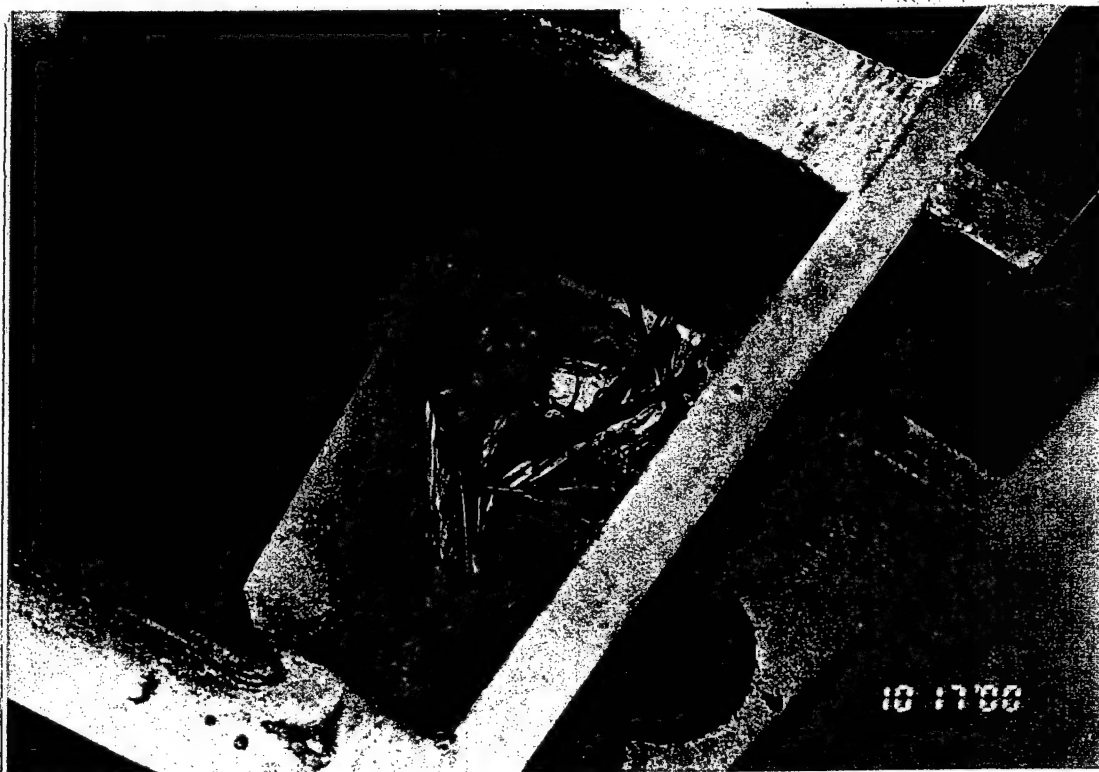


Little  
Goose  
Dam

**Gate 2**  
Leak at center construction joint in  
spillway monolith.

10/17/00

2-9



Little  
Goose  
Dam

**Gate 2**  
Left frame between brace J and K.  
Debris at upstream end of bottom  
radial strut.

10/17/00

2-10





Little  
Goose  
Dam

10/17/00

2-11

#### Gate 2

Bottom horizontal girder, left end.  
Standing water, no drainage between  
multiple stiffeners, typical.



Little  
Goose  
Dam

10/17/00

2-12

#### Gate 2

Bottom horizontal girder, Right end.  
Standing water, no drainage between  
multiple stiffeners, typical.



Little  
Goose  
Dam

Gate 2  
Left frame, typical.

10/17/00

2-13



Little  
Goose  
Dam

Gate 2  
Leak, bottom left corner of gate.  
Bottom seal closure plate. Standing  
water between closure plate, purlin  
webs and skinplate. Typical.

10/17/00

2-14

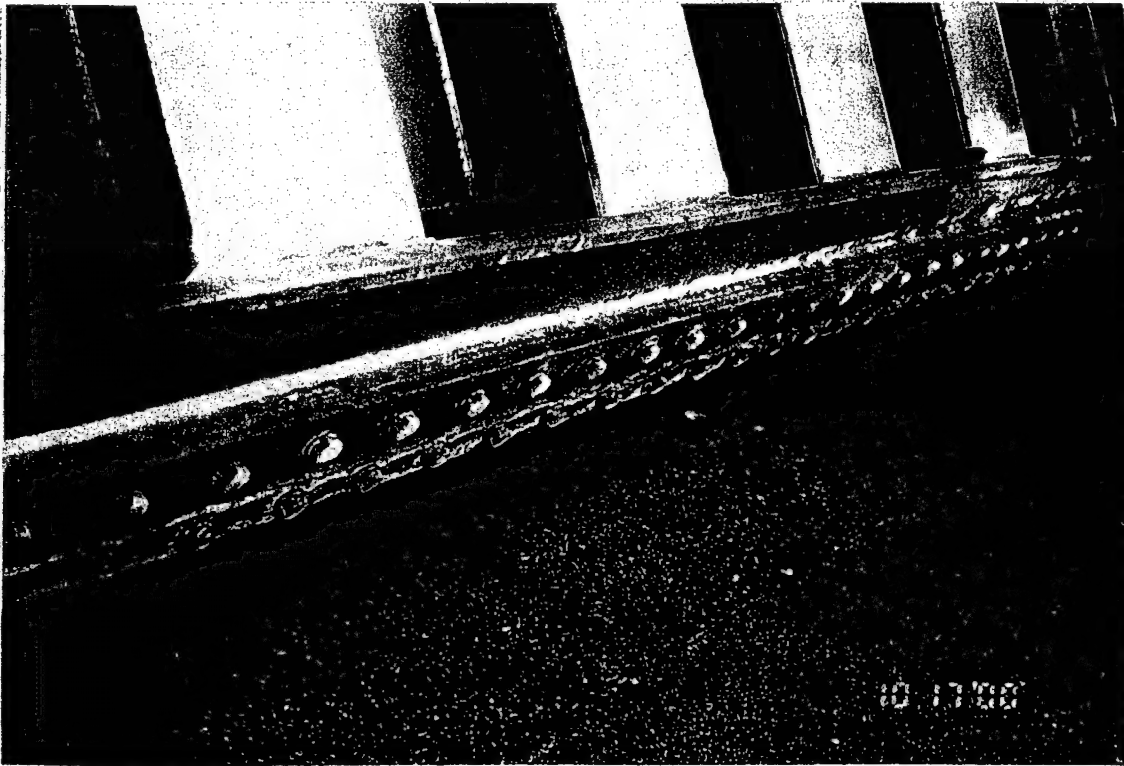


Little  
Goose  
Dam

Gate 2  
Leak at center construction joint in  
spillway monolith.

10/17/00

2-15



Little  
Goose  
Dam

Gate 2  
Bottom seal keeper plate, light  
corrosion. Embedded bottom seal  
plate, typical.

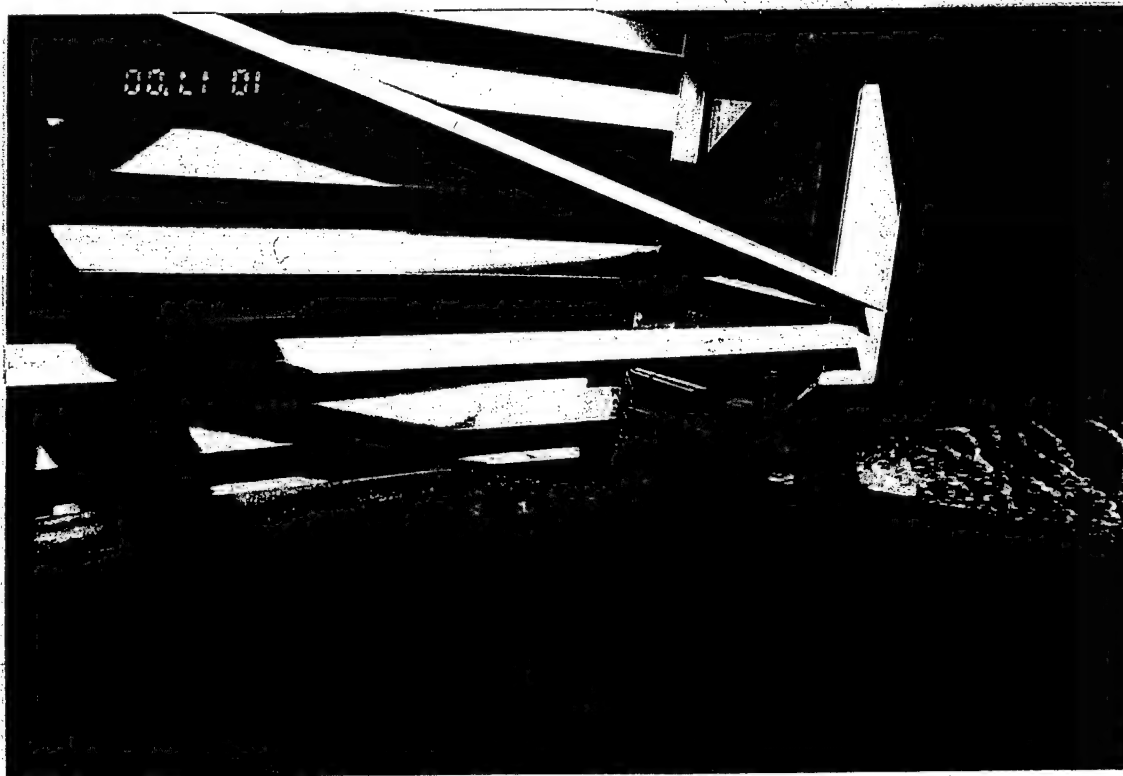
10/17/00

2-16



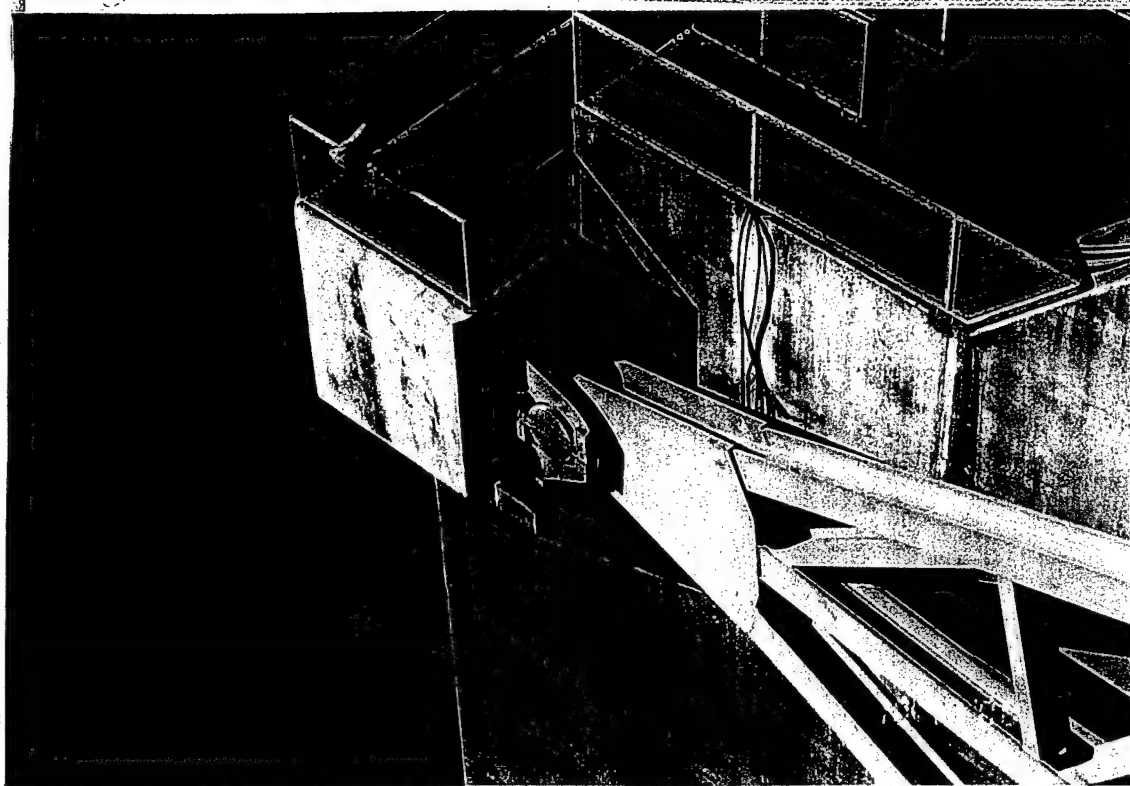
Little  
 Goose  
 Dam  
 10/17/00  
 2-17

**Gate 2**  
 Inside closure plate at right trunnion.  
 Light corrosion and staining from  
 drain hole above.



Little  
 Goose  
 Dam  
 10/17/00  
 2-18

**Gate 2**  
 Side seal leak, right side of gate.

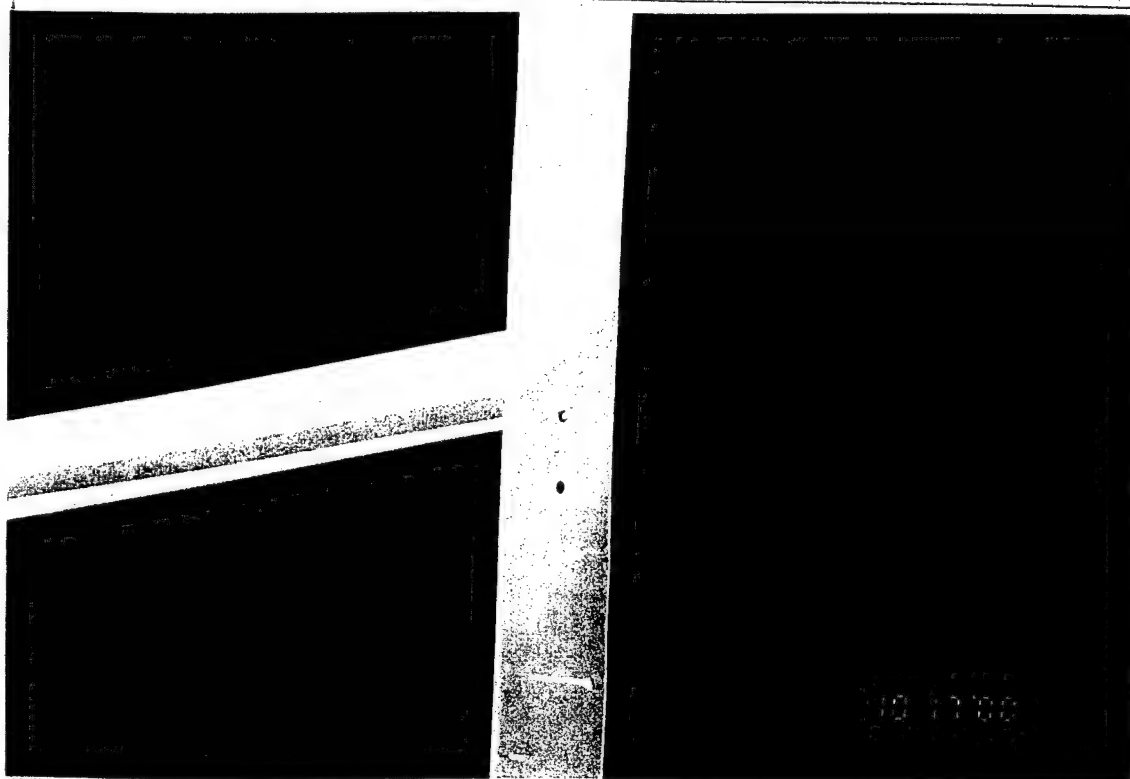


Little  
Goose  
Dam

Gate 2  
Right trunnion block, typical.

10/17/00

2-19



Little  
Goose  
Dam

Gate 2  
Extraneous holes, top plate at  
purlins.

10/17/00

2-20



Little  
Goose  
Dam

Gate 2  
Bottom seal keeper plate, typical.

10/20/00

2-21



Little  
Goose  
Dam

Gate 2  
Bottom seal, typical.

10/20/00

2-22

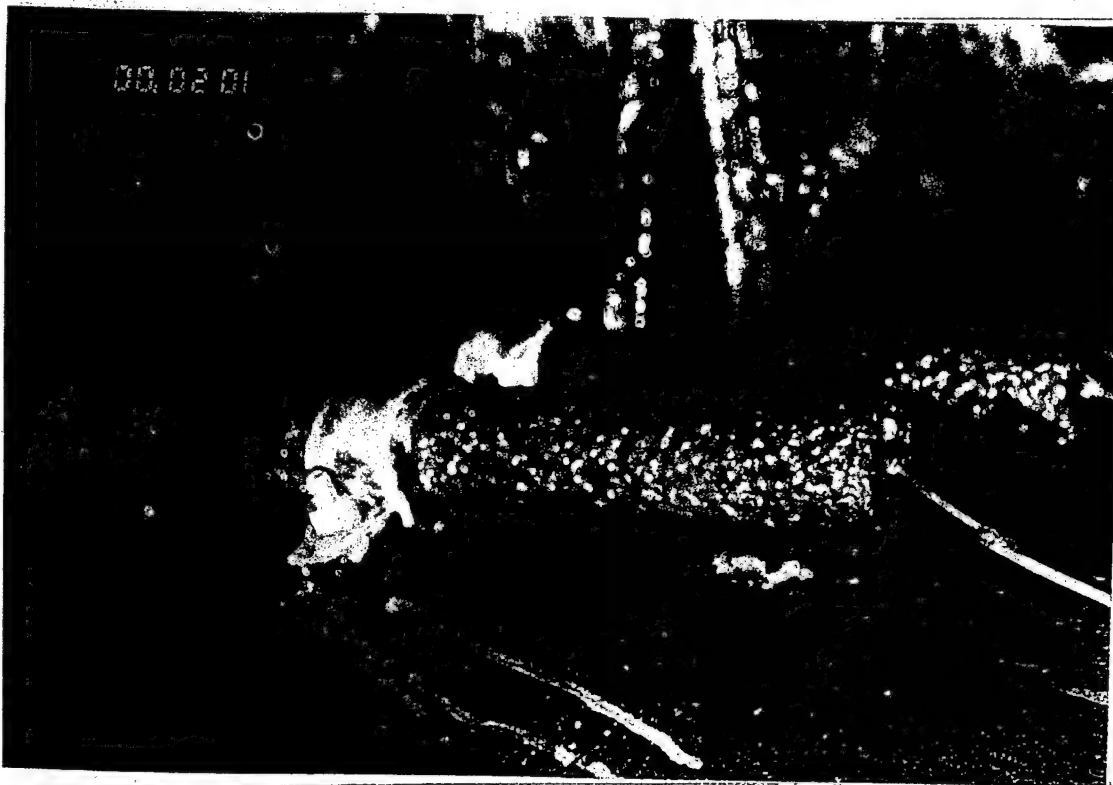


Little  
Goose  
Dam

10/20/00

2-23

Gate 2  
Right hoist connection and zinc  
anodes. Light corrosion on lifting  
lugs.



Little  
Goose  
Dam

10/20/00

2-24

Gate 2  
Zinc anodes, good condition.





Little  
Goose  
Dam

Gate 2  
Bottom of hoist connection. Light  
corrosion on plates.

10/20/00

2-25



Little  
Goose  
Dam

Gate 2  
Unidentified metal clamp near hoist  
connection.

10/20/00

2-26





Little  
Goose  
Dam

10/20/00

2-27

#### Gate 2

Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate. Typical.



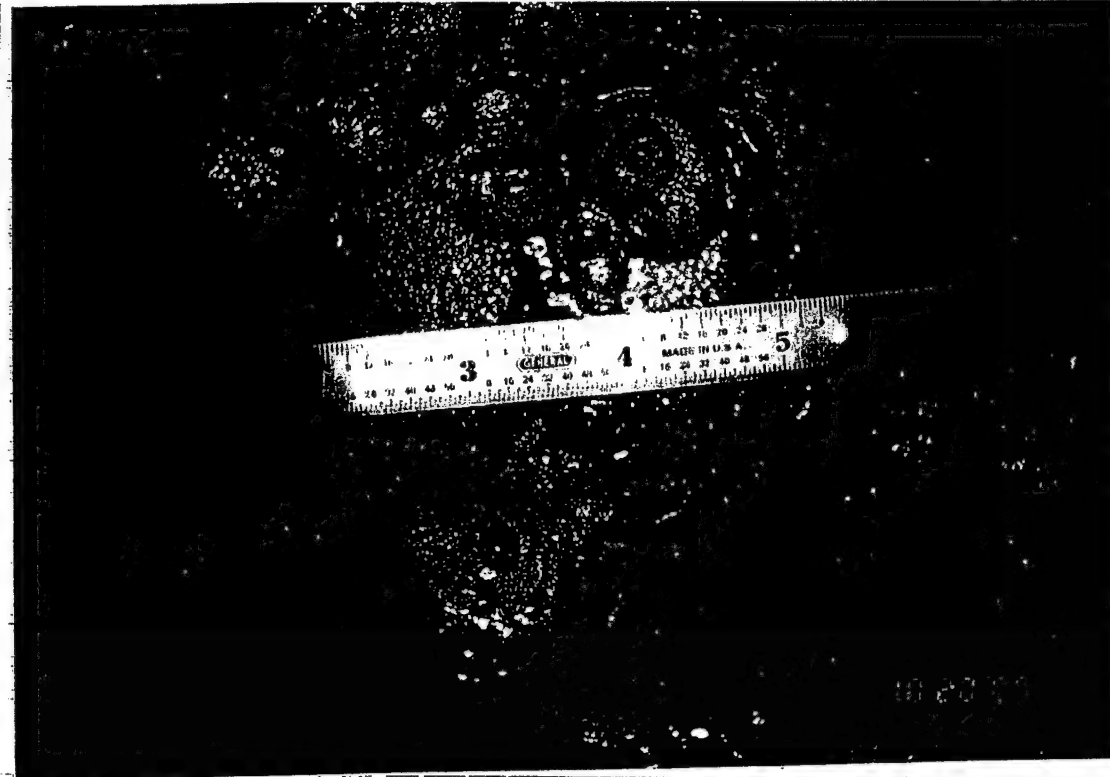
Little  
Goose  
Dam

10/20/00

2-28

#### Gate 2

Skin plate pitting, typical.



Little  
Goose  
Dam

Gate 2  
Skin plate pitting, typical.

10/20/00

2-29

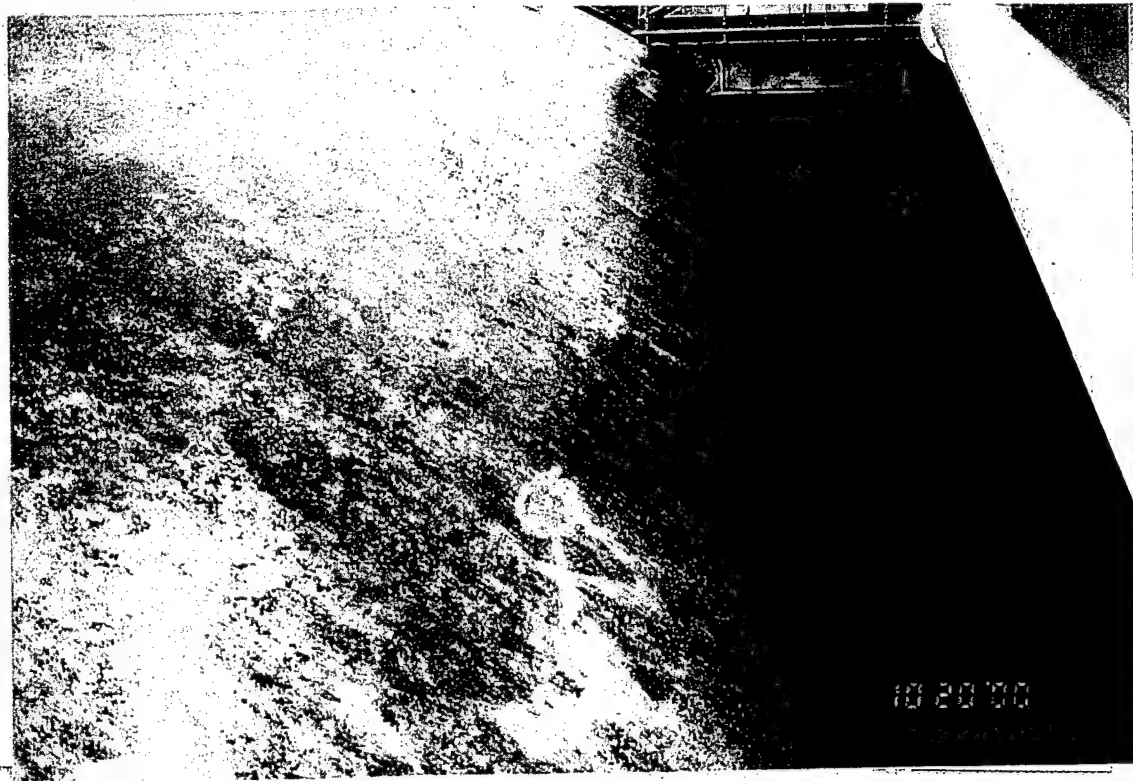


Little  
Goose  
Dam

Gate 2  
Skin plate pitting, typical.

10/20/00

2-30



Little  
Goose  
Dam

10/20/00

2-31

Gate 2  
Skin plate condition, typical.



Little  
Goose  
Dam

10/20/00

2-32

Gate 2  
Top of hoist connection.

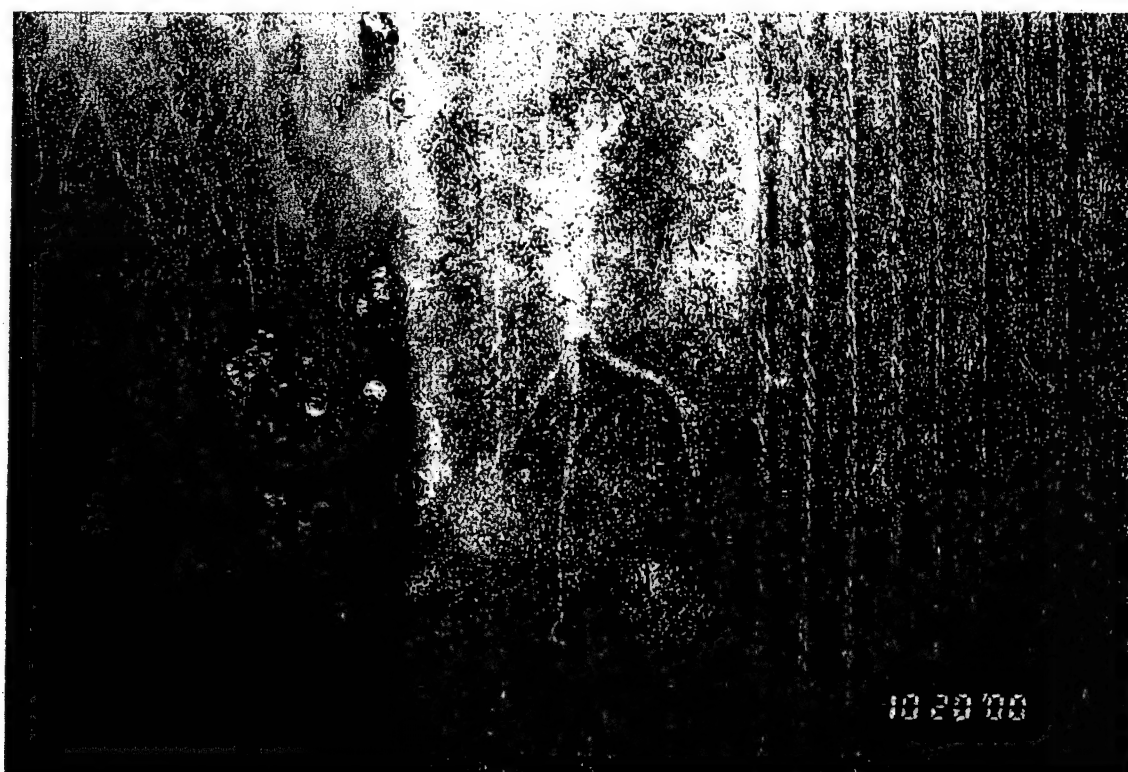


Little  
Goose  
Dam

10/20/00

2-33

Gate 2  
Delaminates vinyl, right side of wear  
plate, just below skin plate transition  
from 3/8" to 1/2".



Little  
Goose  
Dam

10/20/00

2-34

Gate 2  
Skin plate pitting adjacent to wear  
plate, typical.



Little  
Goose  
Dam

Gate 3  
Left side of gate. Light corrosion on  
members.

10/12/00

3-1



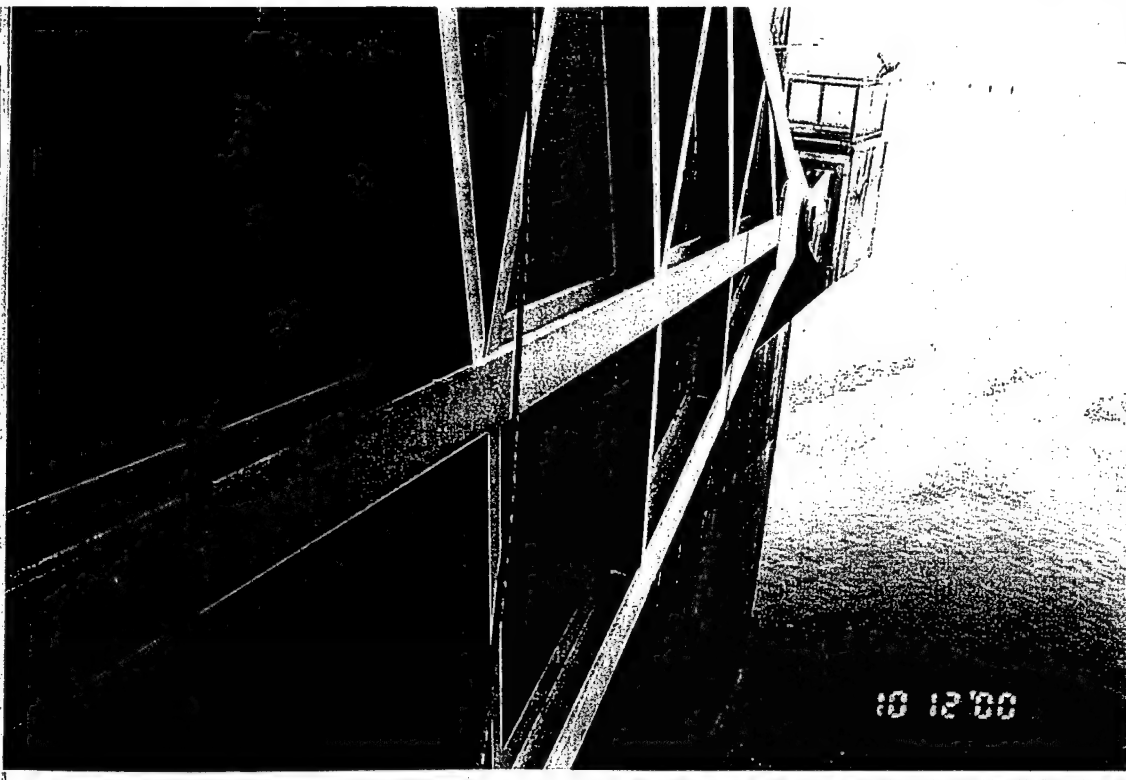
Little  
Goose  
Dam

Gate 3  
Left frame, middle radial strut,  
typical.

10/12/00

3-2





Little  
Goose  
Dam

Gate 3  
Left frame, typical.

10/12/00

3-3

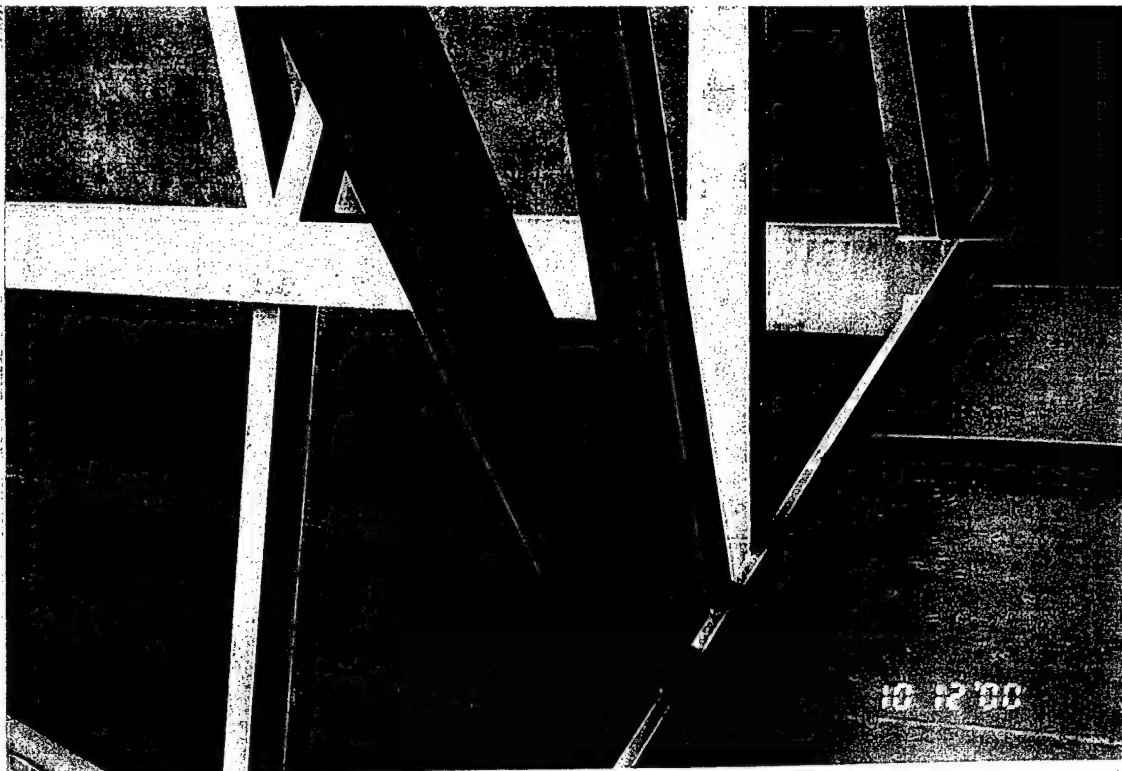


Little  
Goose  
Dam

Gate 3  
Left frame, Brace A. Light corrosion  
on upstream side.

10/12/00

3-4

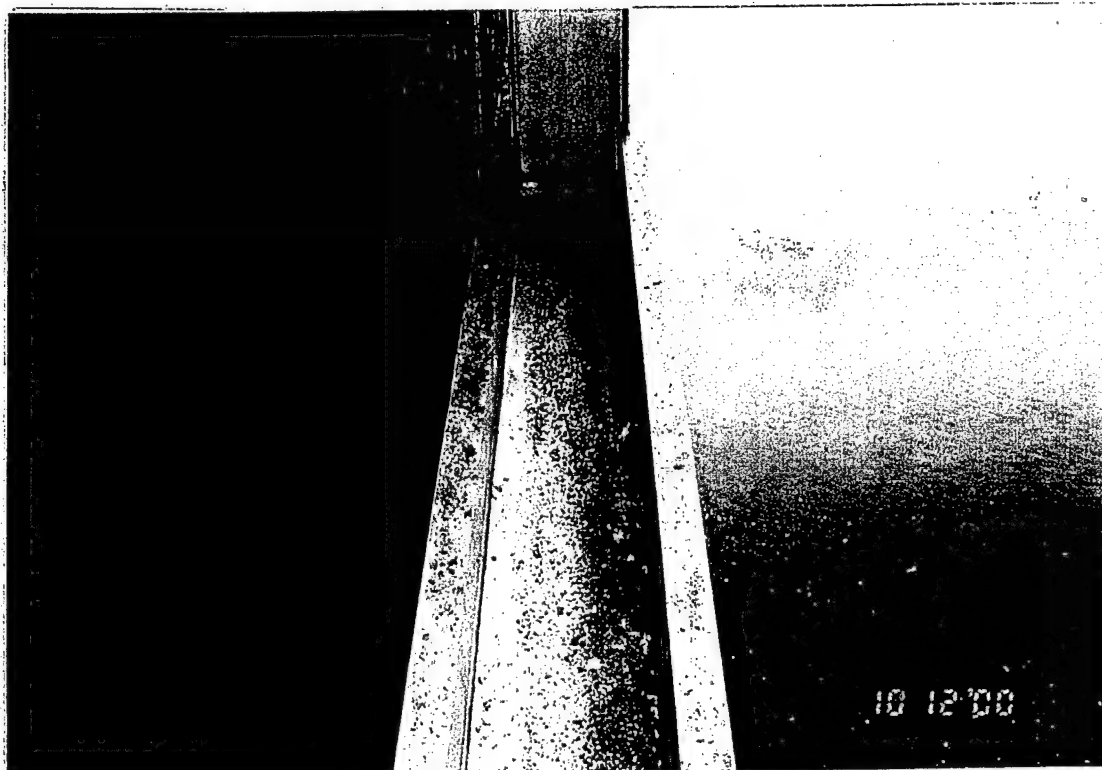


Little  
Goose  
Dam

Gate 3  
Middle horizontal girder bracing.  
Light corrosion on braces.

10/12/00

3-5



Little  
Goose  
Dam

Gate 3  
Middle radial strut, left frame. Light  
corrosion on strut.

10/12/00

3-6



Little  
Goose  
Dam

10/12/00

3-7

**Gate 3**

Bottom horiz. girder, left end.  
Standing water, no drainage between  
multiple stiffeners, typical.



Little  
Goose  
Dam

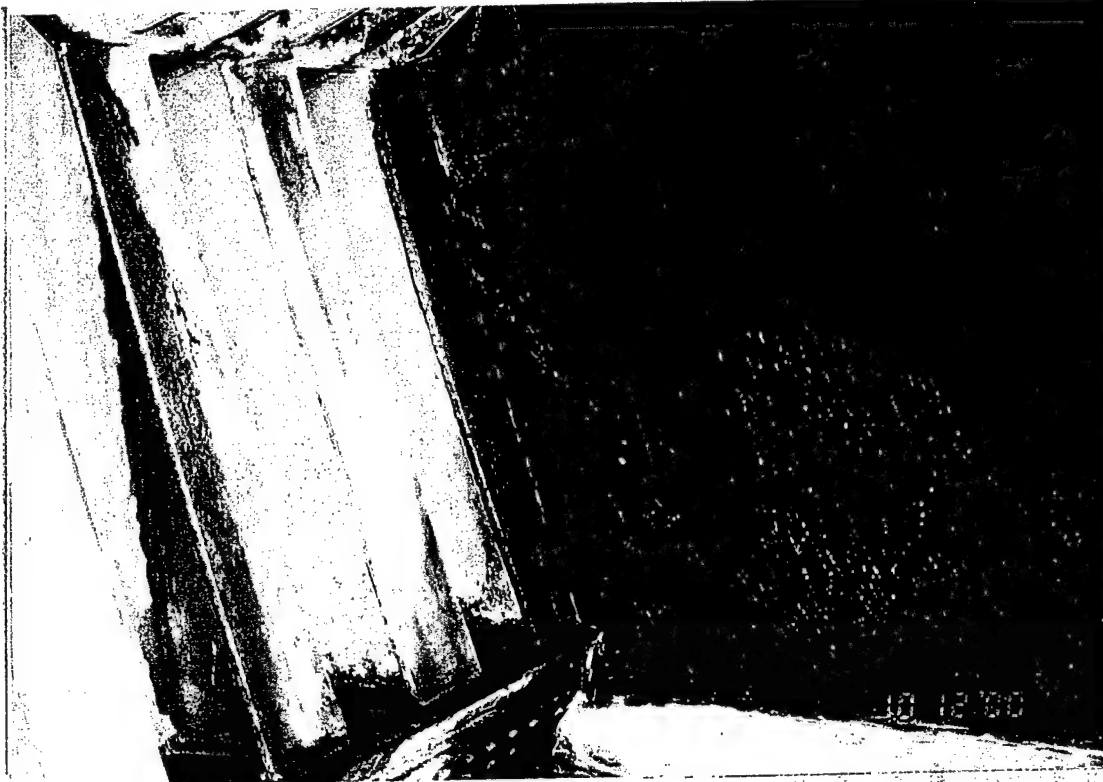
10/12/00

3-8

**Gate 3**

Standing water between closure plate,  
purlin webs and skinplate, typical.  
Light corrosion around drain hole at  
upstream side of bottom radial strut.





Little  
Goose  
Dam

10/12/00

3-9

#### Gate 3

Side seal leak, bottom left corner of gate. Standing water between closure plate, purlin webs and skinplate, typical.



Little  
Goose  
Dam

10/12/00

3-10

#### Gate 3

Standing water between closure plate, purlin webs and skinplate, typical.



Little  
Goose  
Dam

**Gate 3**  
Leak at center construction joint in  
spillway monolith.

10/12/00

3-11



Little  
Goose  
Dam

**Gate 3**  
Bottom horizontal girder, right end.  
Standing water, no drainage between  
multiple stiffeners, typical.

10/12/00

3-12



Little  
Goose  
Dam  
10/12/00  
3-13

Gate 3  
Close-up, bottom horizontal girder.  
Standing water, no drainage between  
multiple stiffeners, typical.



Little  
Goose  
Dam  
10/12/00  
3-14

Gate 3  
Bottom side of right frame, typical.

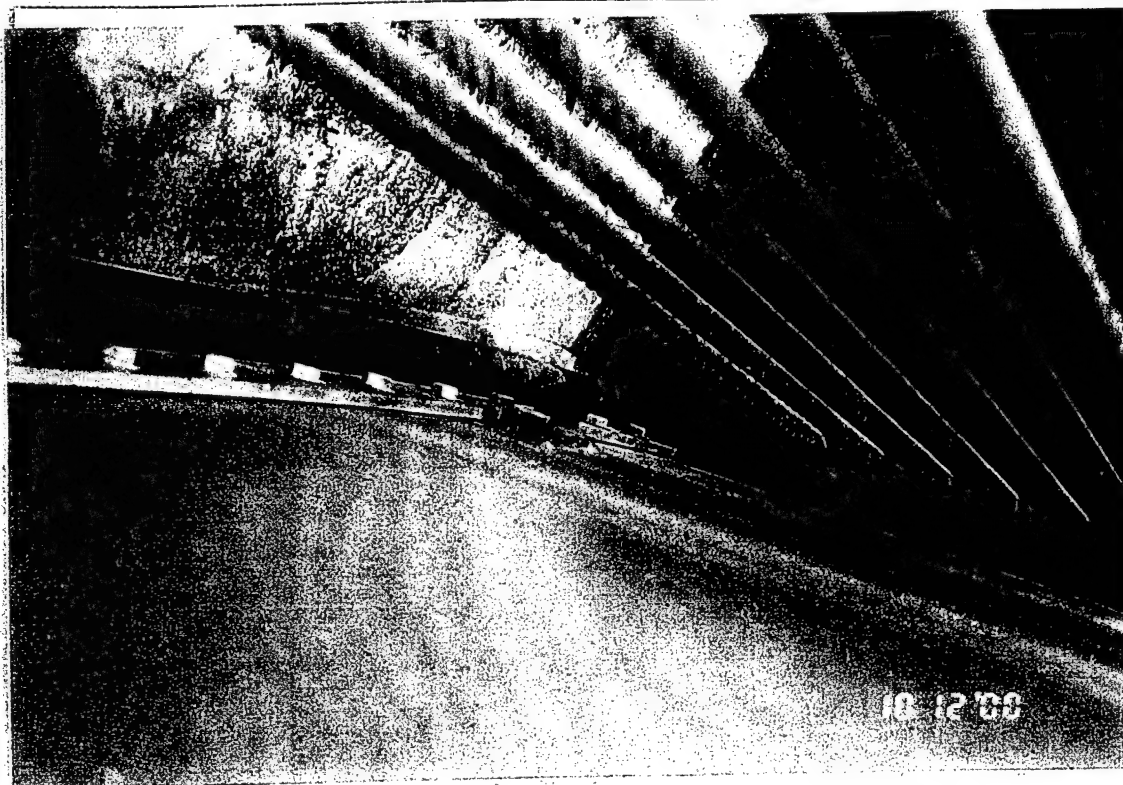


Little  
Goose  
Dam

Gate 3  
Top of side seal, typical.

10/12/00

3-15



Little  
Goose  
Dam

Gate 3  
Top upstream skinplate at hoist  
cables. Moderate corrosion on  
unidentified metal.

10/12/00

3-16



Little  
Goose  
Dam

10/19/00

3-17

#### Gate 3

Bottom of left side of gate at 3' open.

Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.



Little  
Goose  
Dam

10/19/00

3-18

#### Gate 3

Bottom of right side of gate at 3' open.

Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.



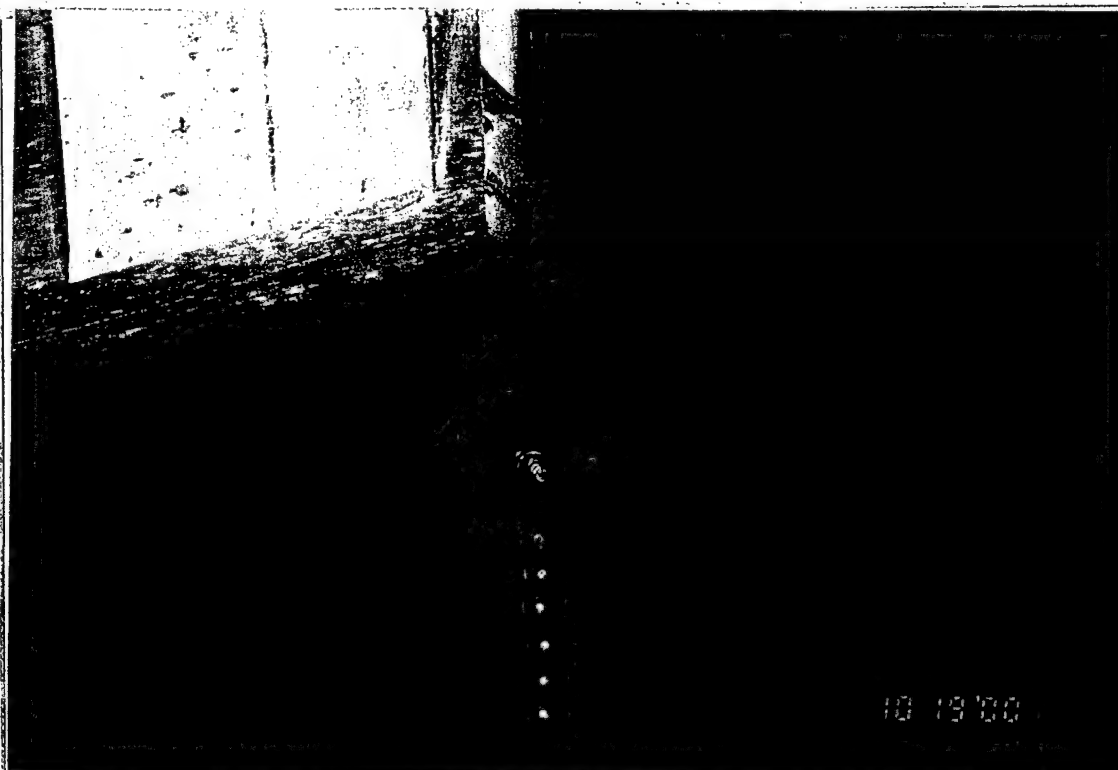
Little  
Goose  
Dam

10/19/00

3-19

**Gate 3**

Skin plate condition, typical.  
Minimal pitting.



Little  
Goose  
Dam

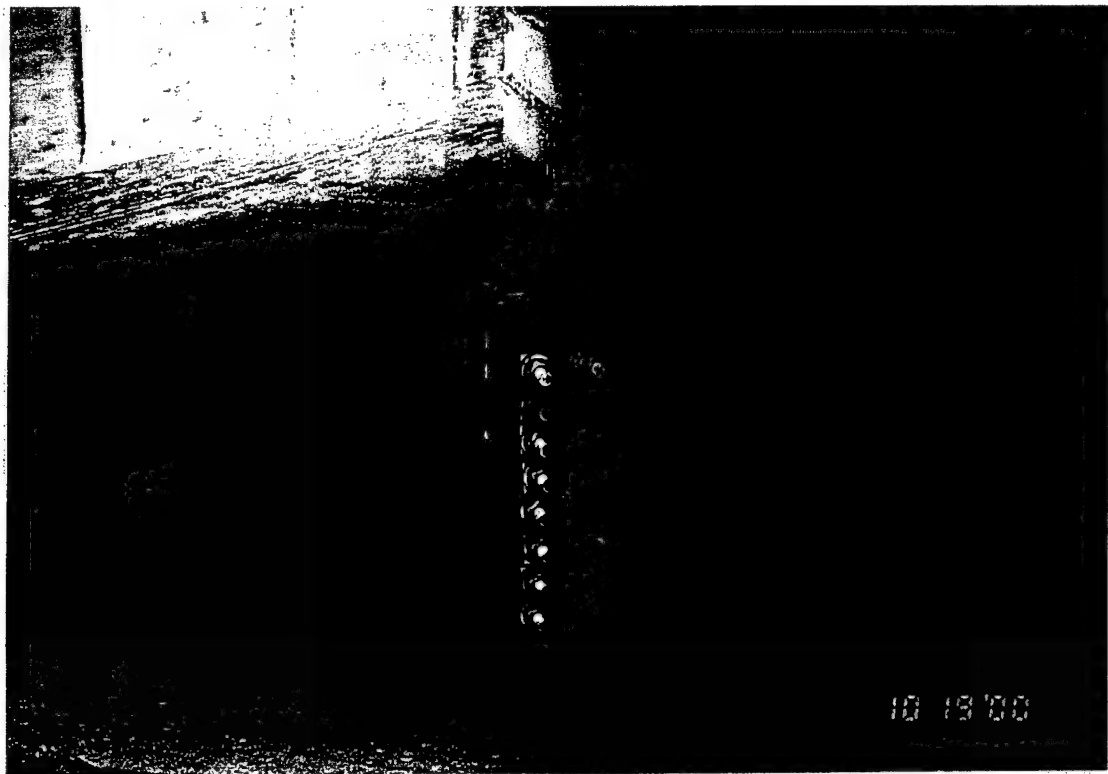
10/19/00

3-20

**Gate 3**

Hoist connection, right side of gate.





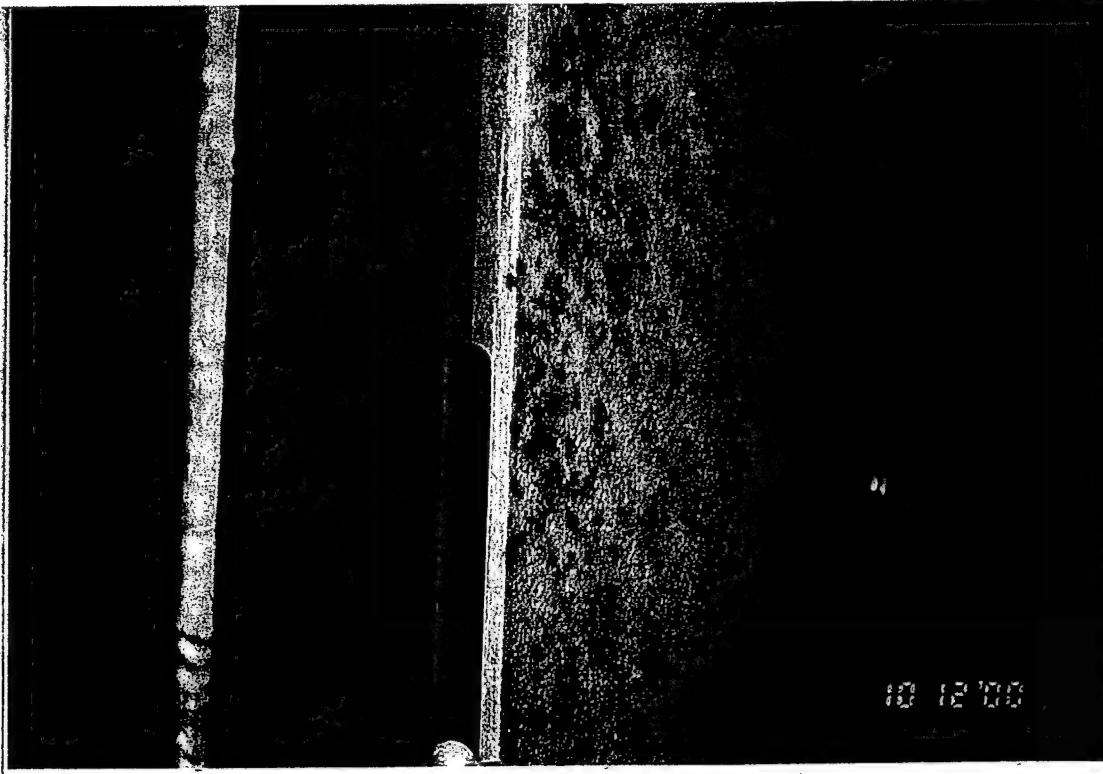
Little  
Goose  
Dam

10/19/00

3-21

Gate 3  
Hoist connection, left side of gate.





Little  
Goose  
Dam

10/12/00

4-1

#### Gate 4

Skin plate purlin, right side of gate  
above top horizontal girder. Light  
corrosion on purlin flange.



Little  
Goose  
Dam

10/12/00

4-2

#### Gate 4

Top horizontal girder. Light  
corrosion, typical.



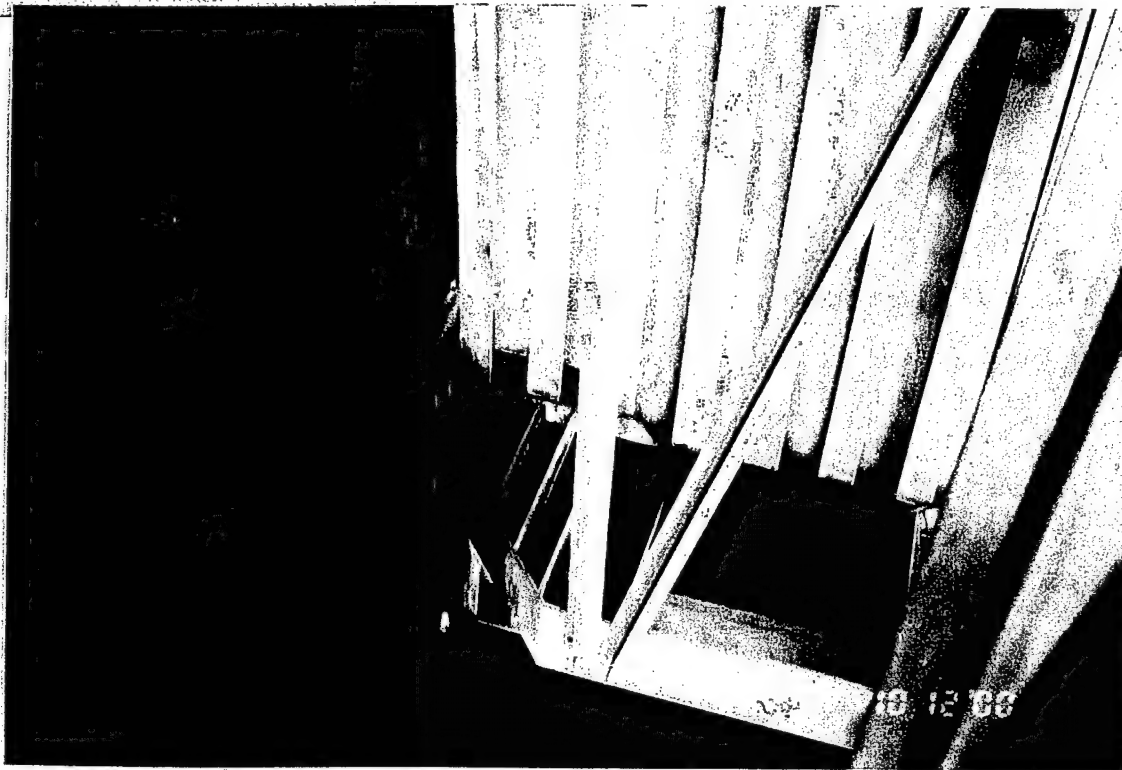
Little  
Goose  
Dam

10/12/00

4-3

#### Gate 4

Downstream side of skin plate, right side of gate above top horizontal girder. Possible previous skin plate repair.



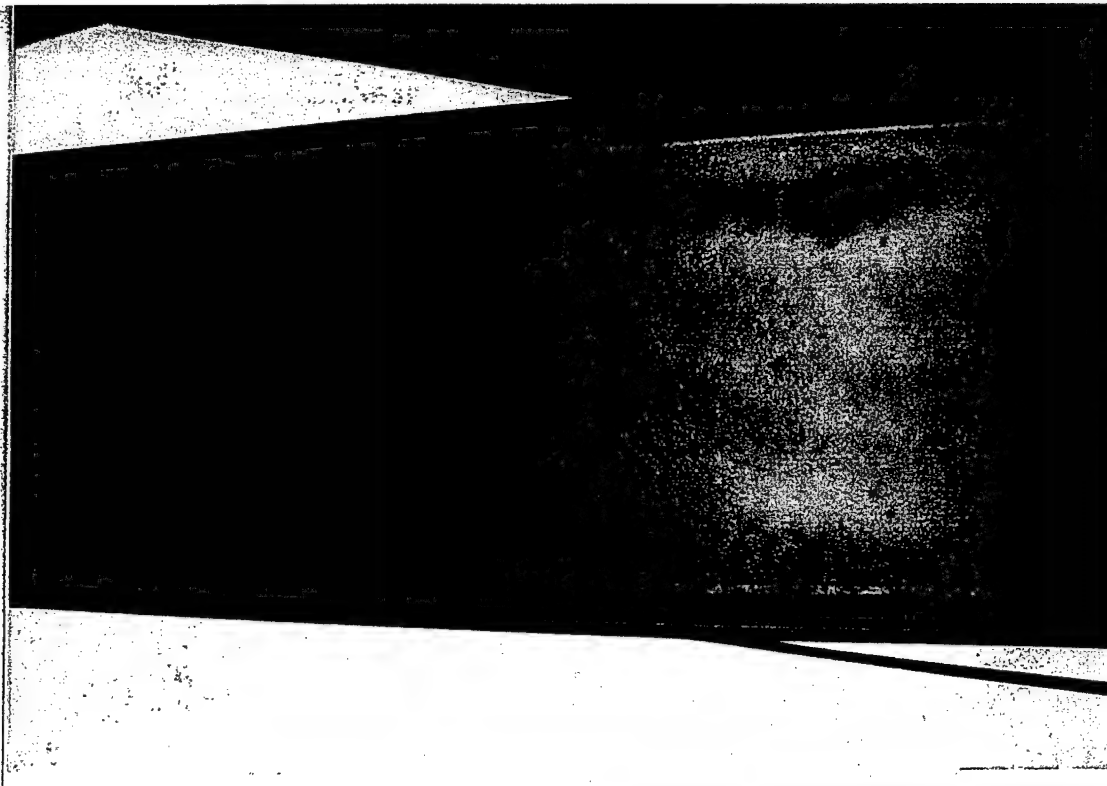
Little  
Goose  
Dam

10/12/00

4-4

#### Gate 4

Bottom horizontal girder, left side. Standing water, no drainage between multiple stiffeners, typical. Side seal leak.



Little  
Goose  
Dam

**Gate 4**

Right frame, brace K. Light corrosion  
on brace.

10/12/00

4-5



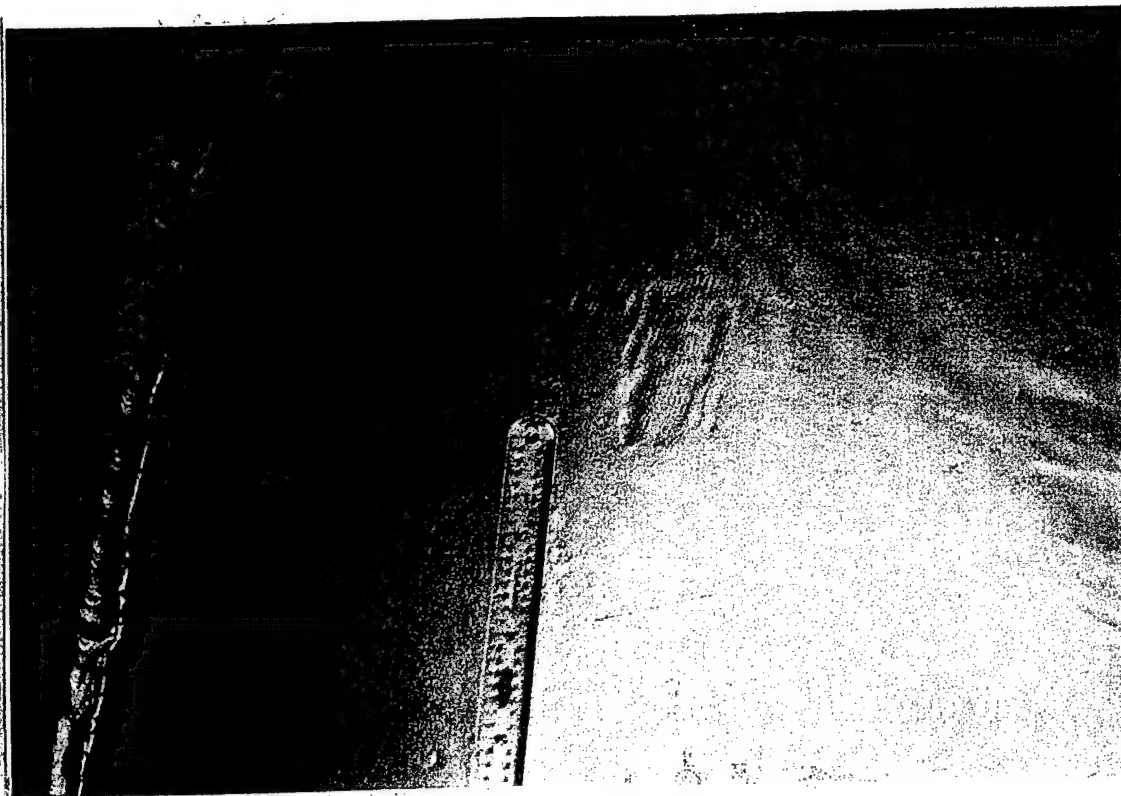
Little  
Goose  
Dam

**Gate 4**

Downstream side of skin plate, above  
middle horizontal girder, right side of  
gate. Small circular protrusion in  
vertical line on skin plate.

10/12/00

4-6



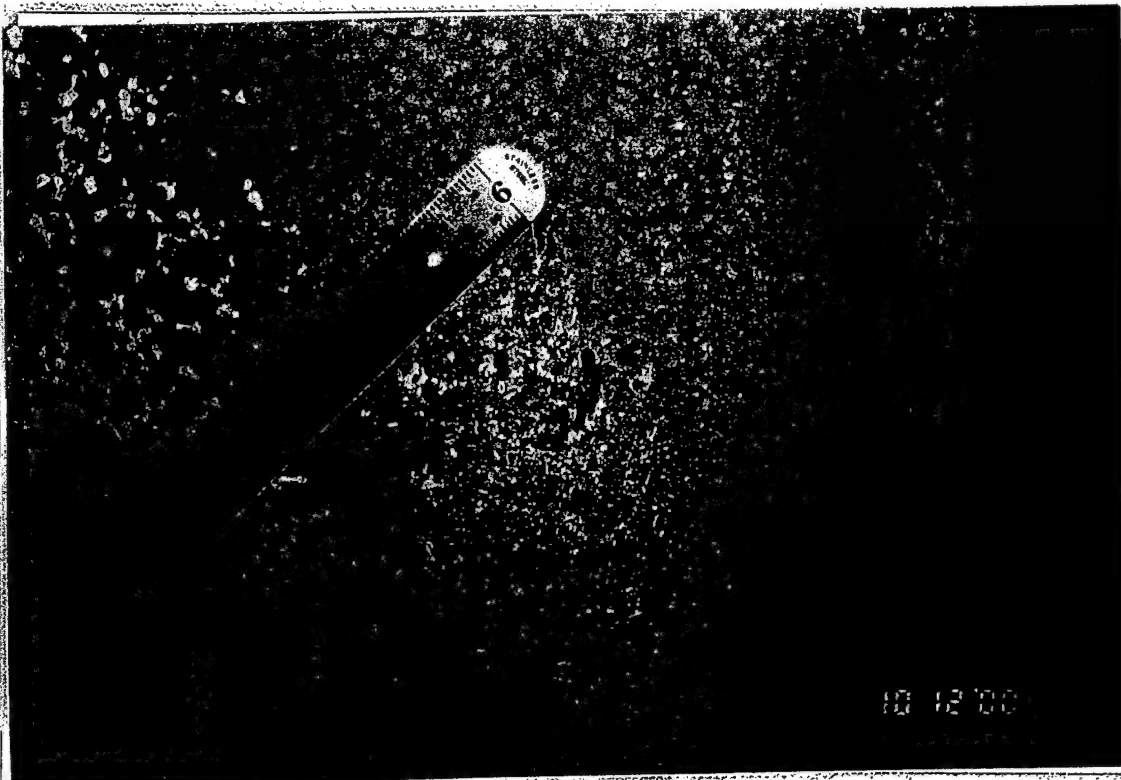
Little  
Goose  
Dam

10/12/00

4-7

Gate 4

Downstream side of skin plate, right  
side of gate above bottom horizontal  
girder. Possible previous skin plate  
repair.



Little  
Goose  
Dam

10/12/00

4-8

Gate 4

Brace J, left frame. Small scratches  
on web.



Little  
Goose  
Dam

10/12/00

4-9

#### Gate 4

Bottom horizontal girder, right side.  
Standing water, no drainage between  
multiple stiffeners, typical. Side seal  
leak.



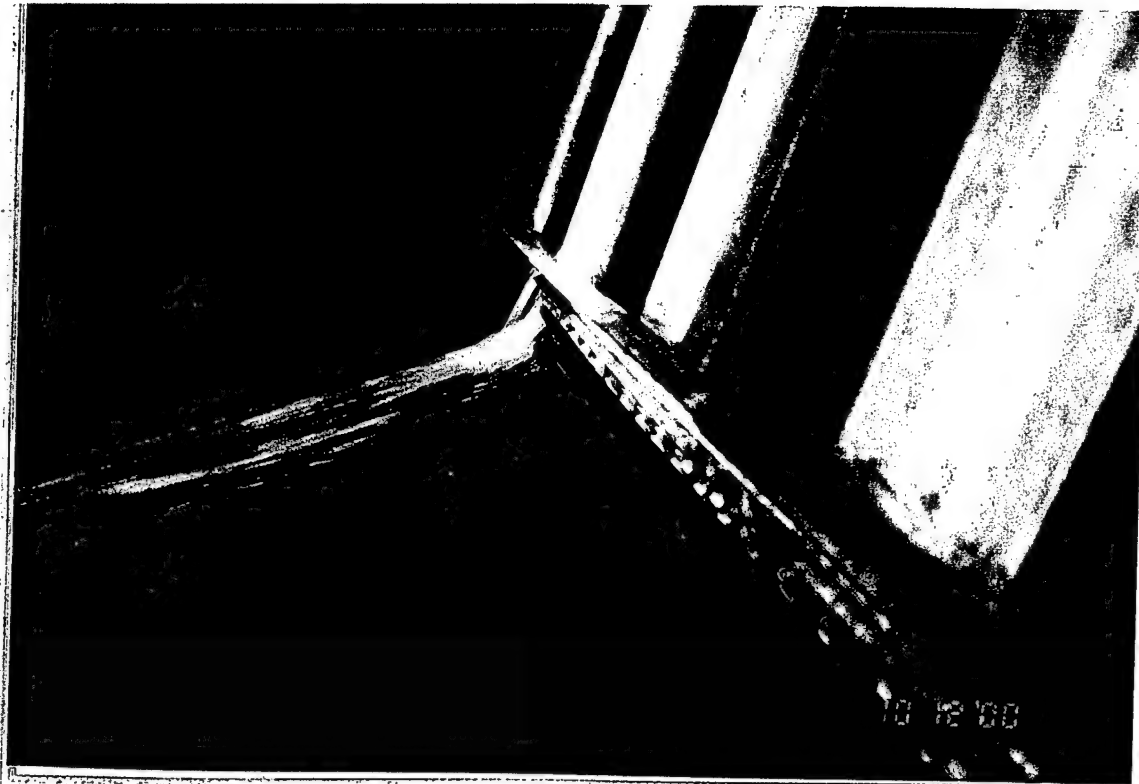
Little  
Goose  
Dam

10/12/00

4-10

#### Gate 4

Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate. Typical.



Little  
Goose  
Dam

10/12/00

4-11

**Gate 4**  
Standing water between closure plate,  
purlin webs and skinplate, typical.  
Bottom right corner seal leak.



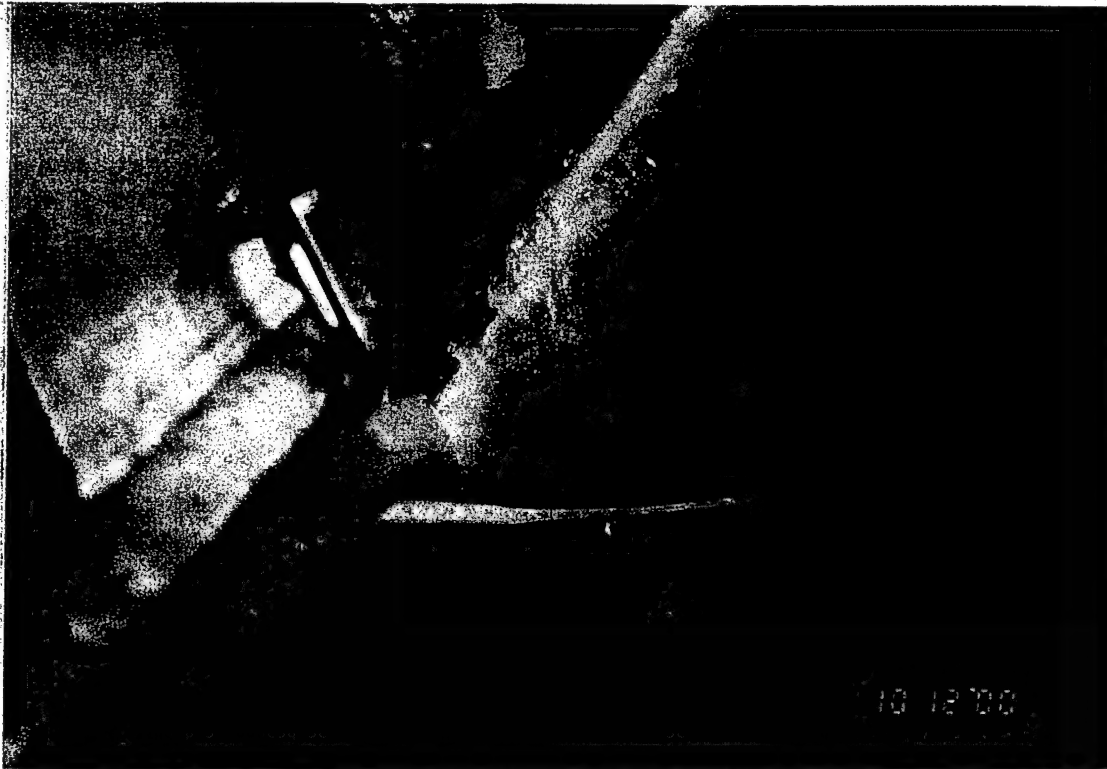
Little  
Goose  
Dam

10/12/00

4-12

**Gate 4**  
Leak at center construction joint in  
spillway monolith.





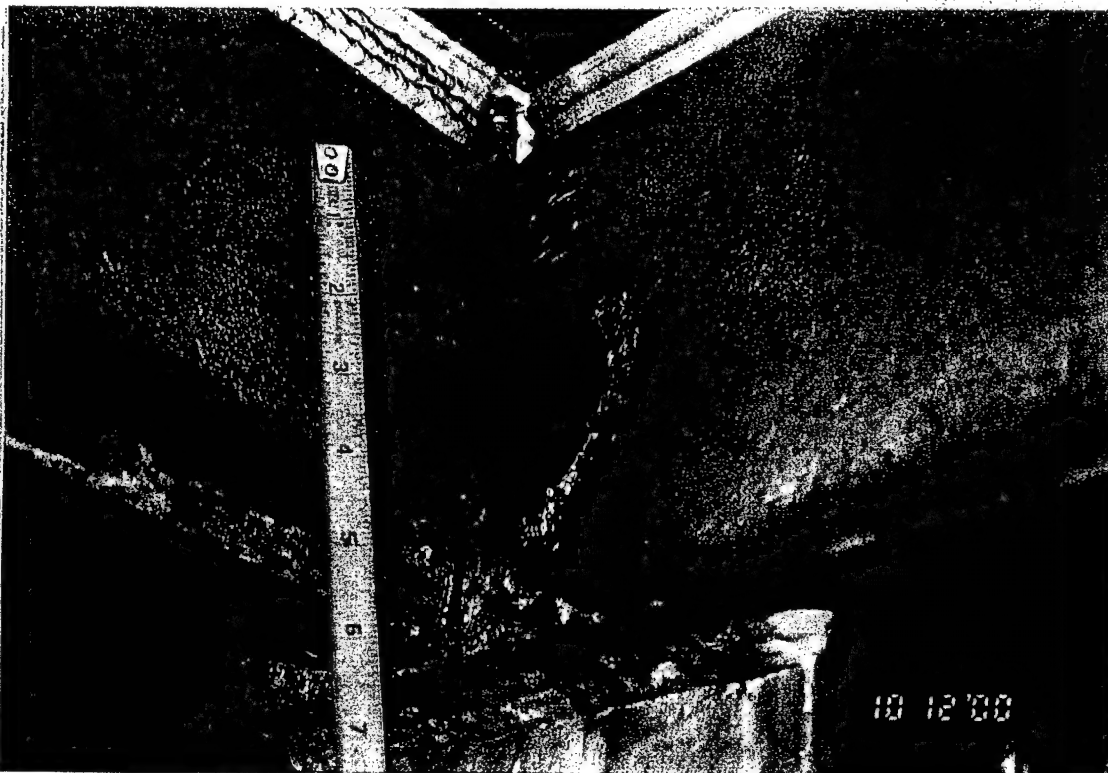
• Little  
Goose  
Dam

**Gate 4**

Leak at center construction joint in  
spillway monolith.

10/12/00

4-13



Little  
Goose  
Dam

**Gate 4**

Bottom of bottom horizontal girder,  
upstream flange and stiffener.  
Moderate corrosion due to horizontal  
girder drain hole above.

10/12/00

4-14





Little  
Goose  
Dam

10/12/00

4-15

#### Gate 4

Bottom of bottom horizontal girder.  
Drain hole for upstream side of  
bottom horizontal girder. Light to  
moderate corrosion on surrounding  
members.



Little  
Goose  
Dam

10/12/00

4-16

#### Gate 4

Bottom of bottom horizontal girder.  
Drain hole for upstream side of  
bottom horizontal girder. Light to  
moderate corrosion on surrounding  
members.



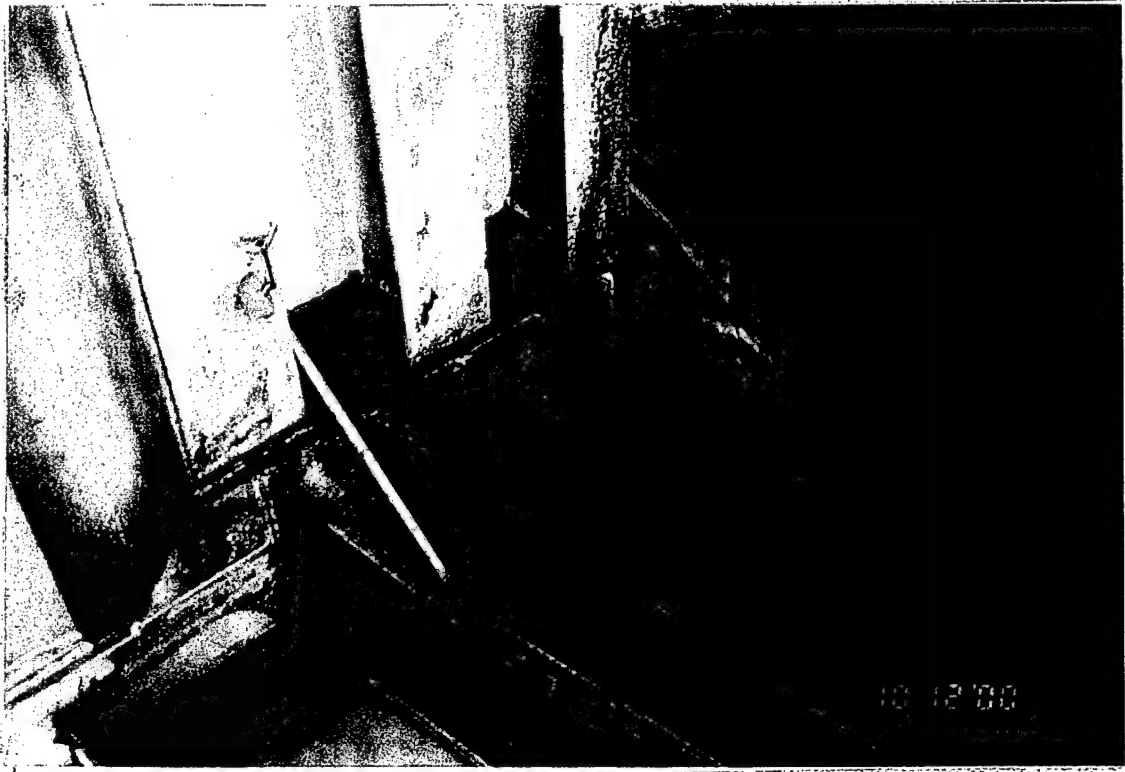
Little  
Goose  
Dam

10/12/00

4-17

#### Gate 4

Bottom of bottom horizontal girder,  
light corrosion on girder, stiffeners  
and purlins.



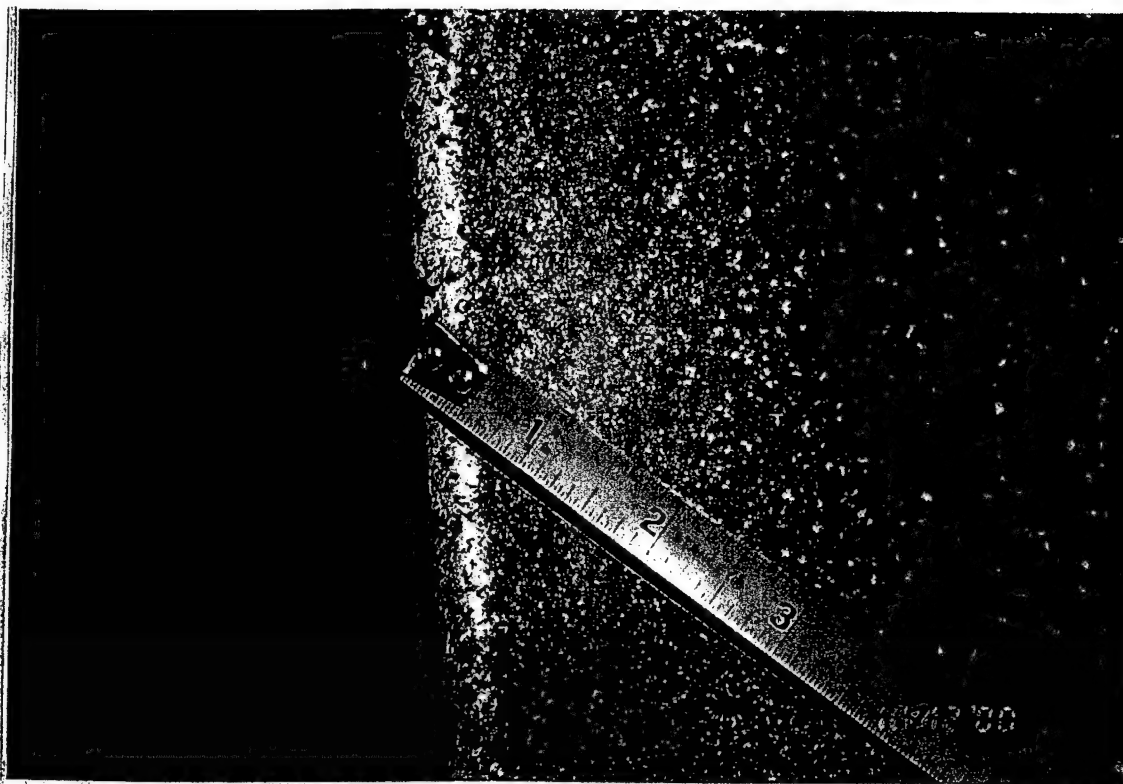
Little  
Goose  
Dam

10/12/00

4-18

#### Gate 4

Bottom horizontal girder, left side.  
Standing water, no drainage between  
multiple stiffeners, typical. Side seal  
leak.



Little  
Goose  
Dam

Gate 4  
Brace N, left frame. Light corrosion  
on brace web and flanges.

10/12/00

4-19



Little  
Goose  
Dam

Gate 4  
Bottom horizontal girder, left side.  
Standing water, no drainage between  
multiple stiffeners, typical. Side seal  
leak.

10/12/00

4-20



Little  
Goose  
Dam

Gate 4  
Side seal leak, left side of gate.

10/12/00

4-21

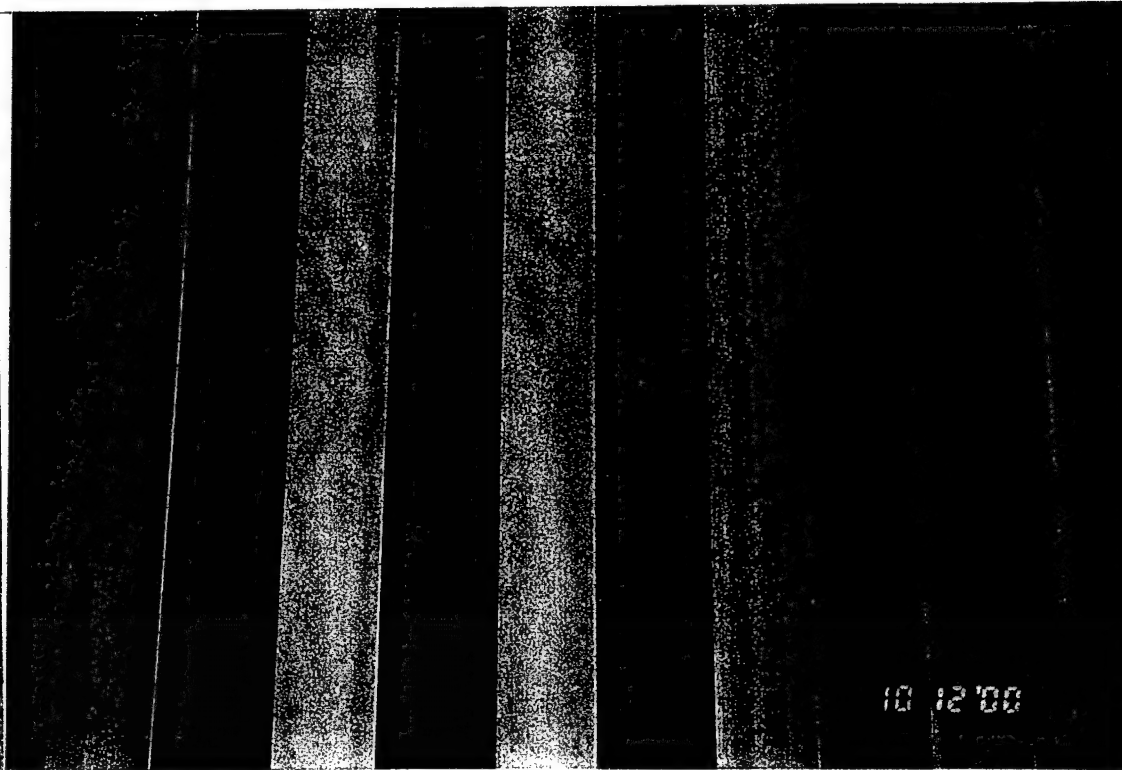


Little  
Goose  
Dam

Gate 4  
Side seal plates, nuts and bolts,  
typical.

10/12/00

4-22



Little  
Goose  
Dam

10/12/00

4-23

**Gate 4**

Downstream side of skin plate.  
Evidence of previous repairs.



Little  
Goose  
Dam

10/19/00

4-24

**Gate 4**

Top horizontal girder, left side. 2" to  
3" deformation upward in girder  
web.



Little  
Goose  
Dam

Gate 4  
Waterblasting and skin plate  
condition, minimal pitting, typical.

10/19/00

4-25



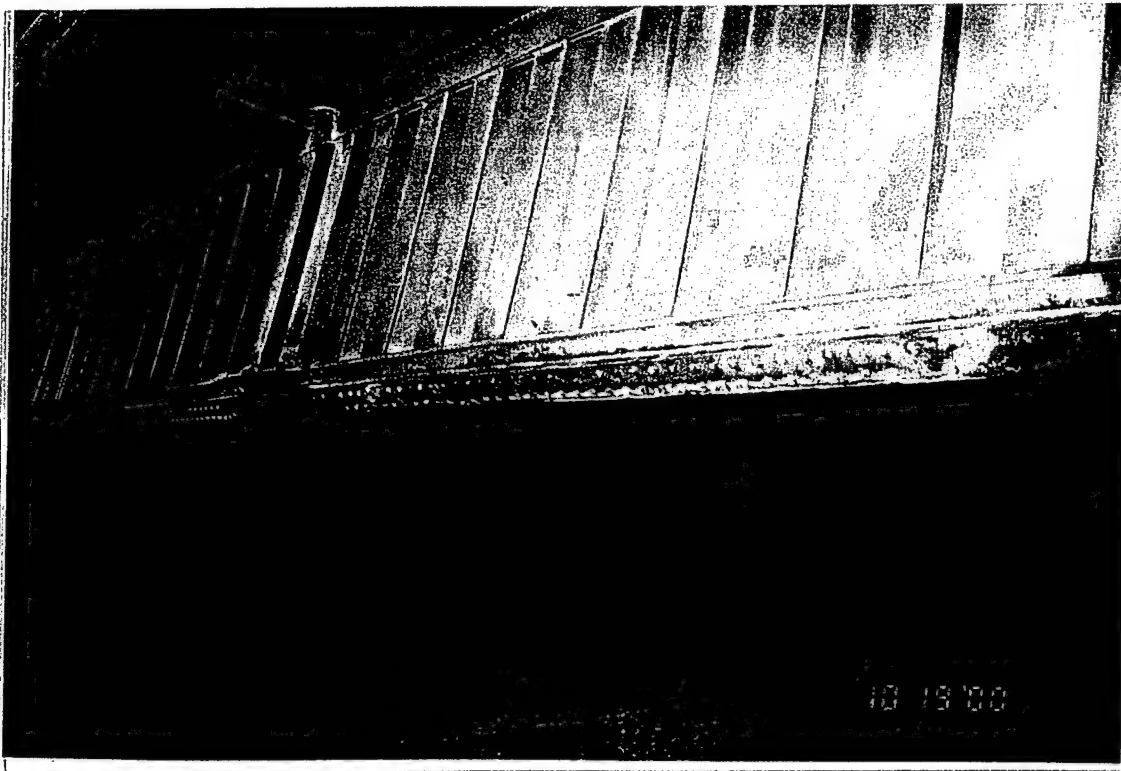
Little  
Goose  
Dam

Gate 4  
Bottom left corner of gate, typical.

10/19/00

4-26



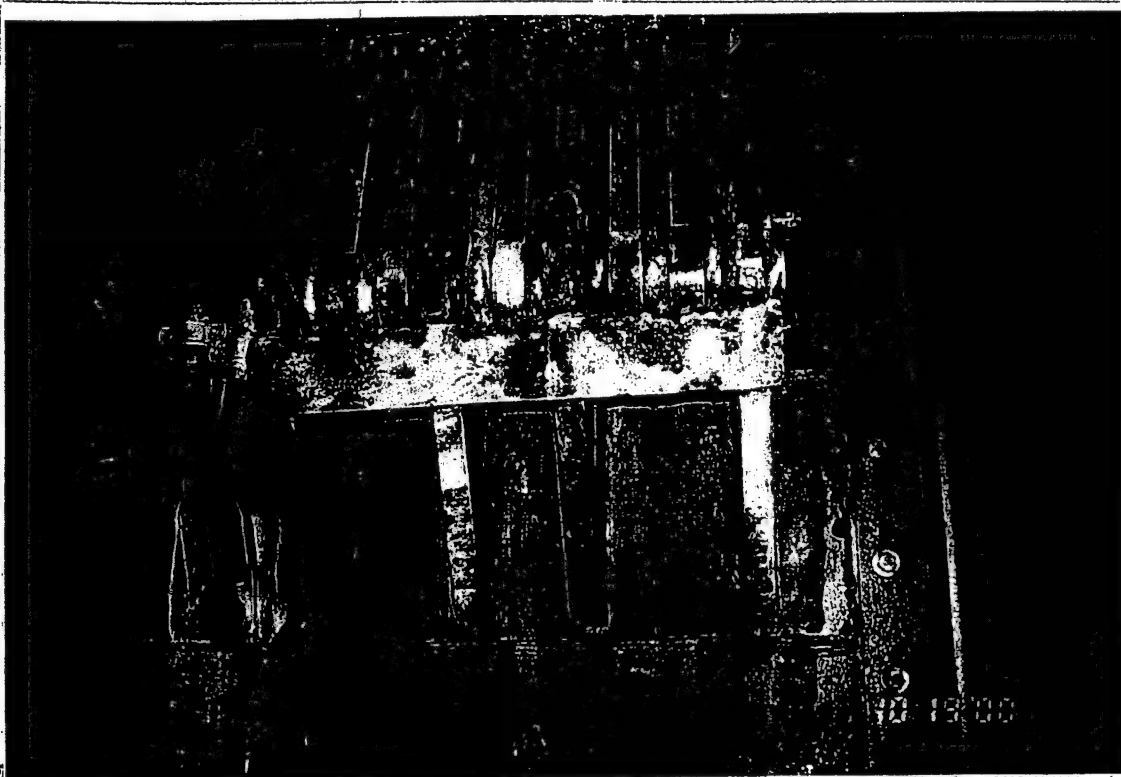


Little  
Goose  
Dam

10/19/00

4-27

Gate 4  
Bottom seal keeper plate, typical.



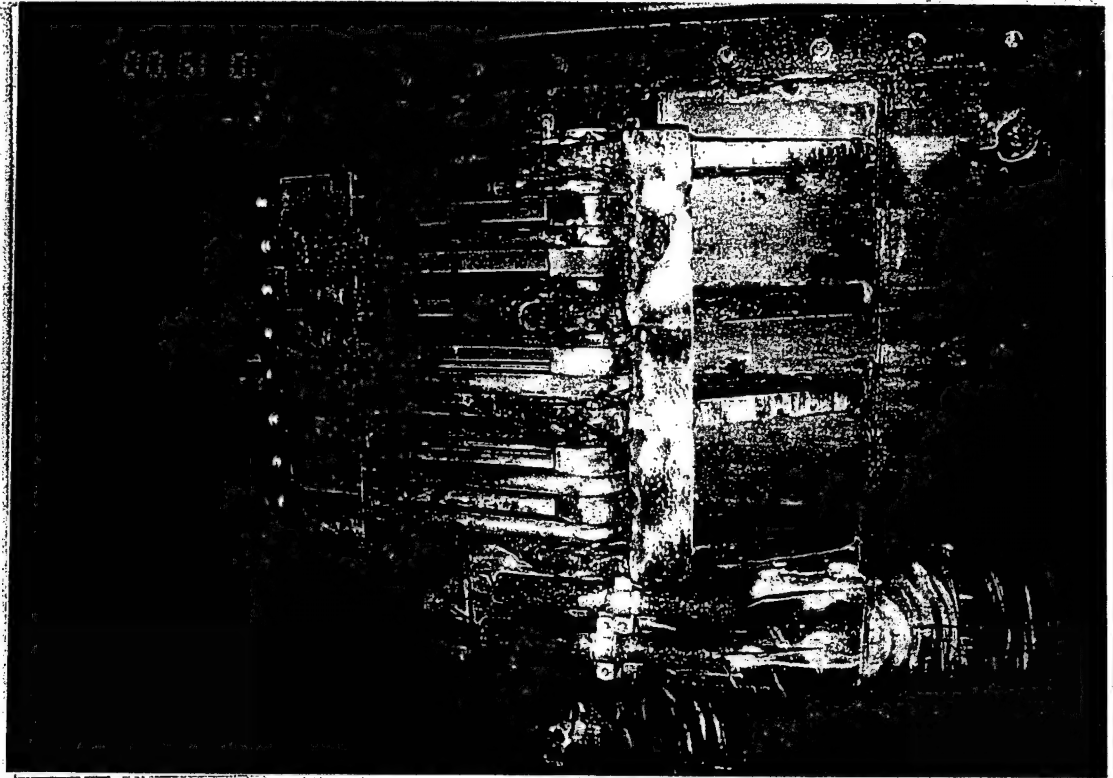
Little  
Goose  
Dam

10/19/00

4-28

Gate 4  
Right hoist connection. Moderate  
corrosion on lifting lugs, and plates.





Little  
Goose  
Dam

**Gate 4**  
Right hoist connection. Moderate  
corrosion on lifting lugs, and plates.

10/19/00

4-29



Little  
Goose  
Dam

**Gate 4**  
Bottom seal and bottom upstream  
side of skin plate. Moderate  
corrosion at bottom edge of skin  
plate.

10/19/00

4-30

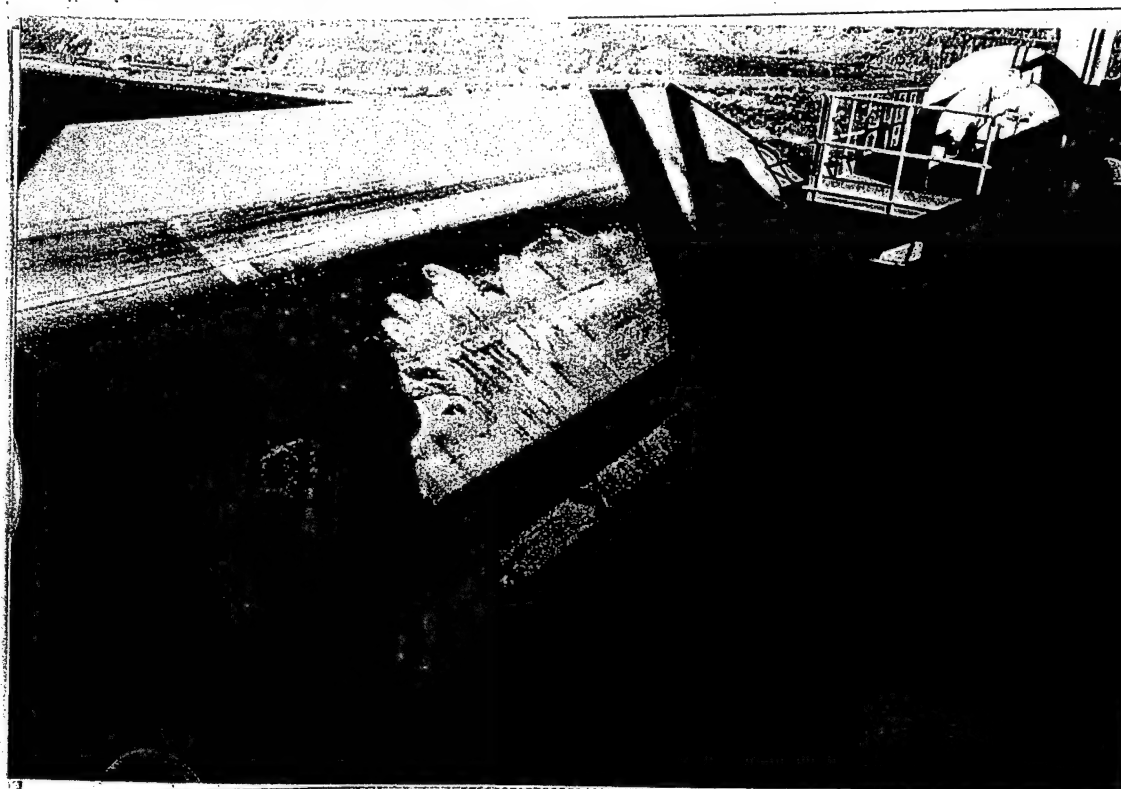


Little  
Goose  
Dam

10/19/00

4-31

Gate 4  
Bottom seal, typical.

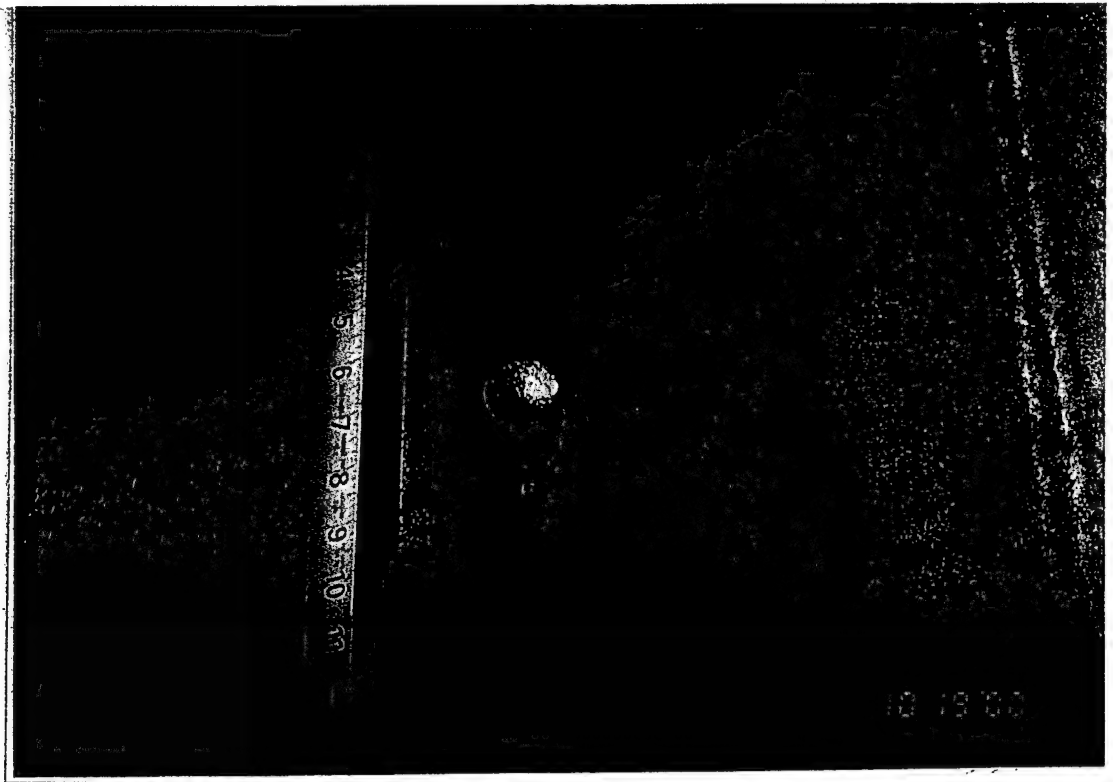


Little  
Goose  
Dam

10/19/00

4-32

Gate 4  
Skin plate condition, minimal pitting,  
typical.

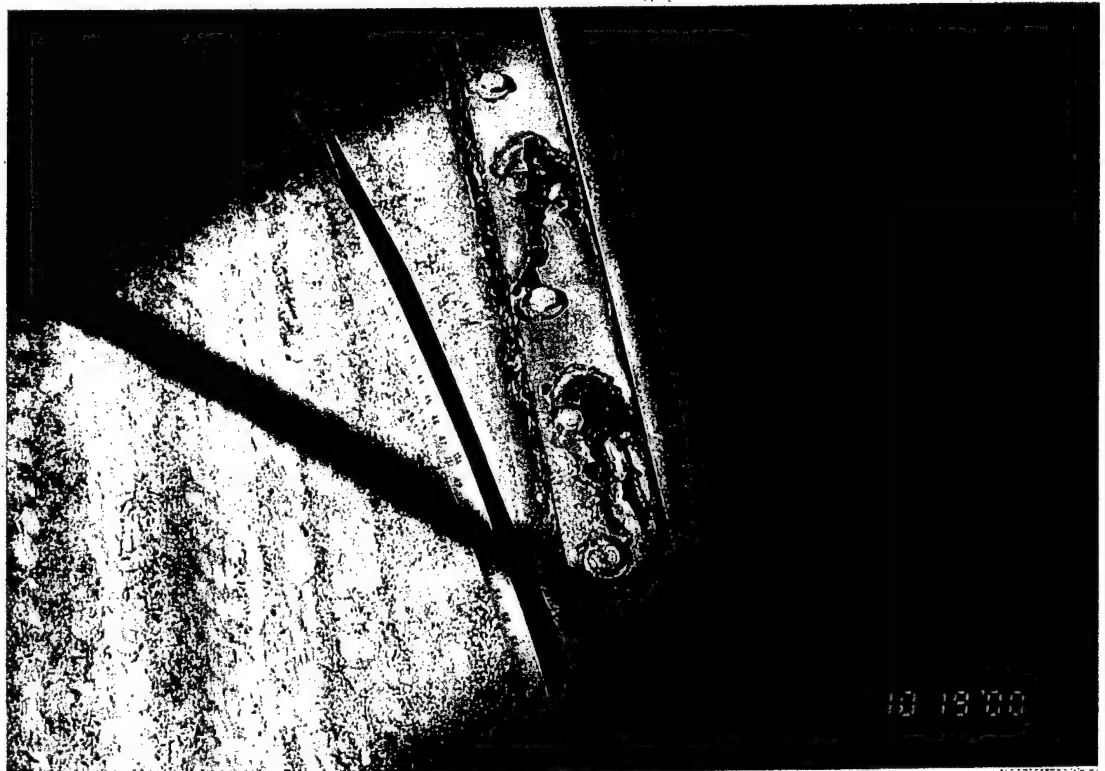


Little  
Goose  
Dam

Gate 4  
Skin plate pitting, where present,  
typical.

10/19/00

4-33

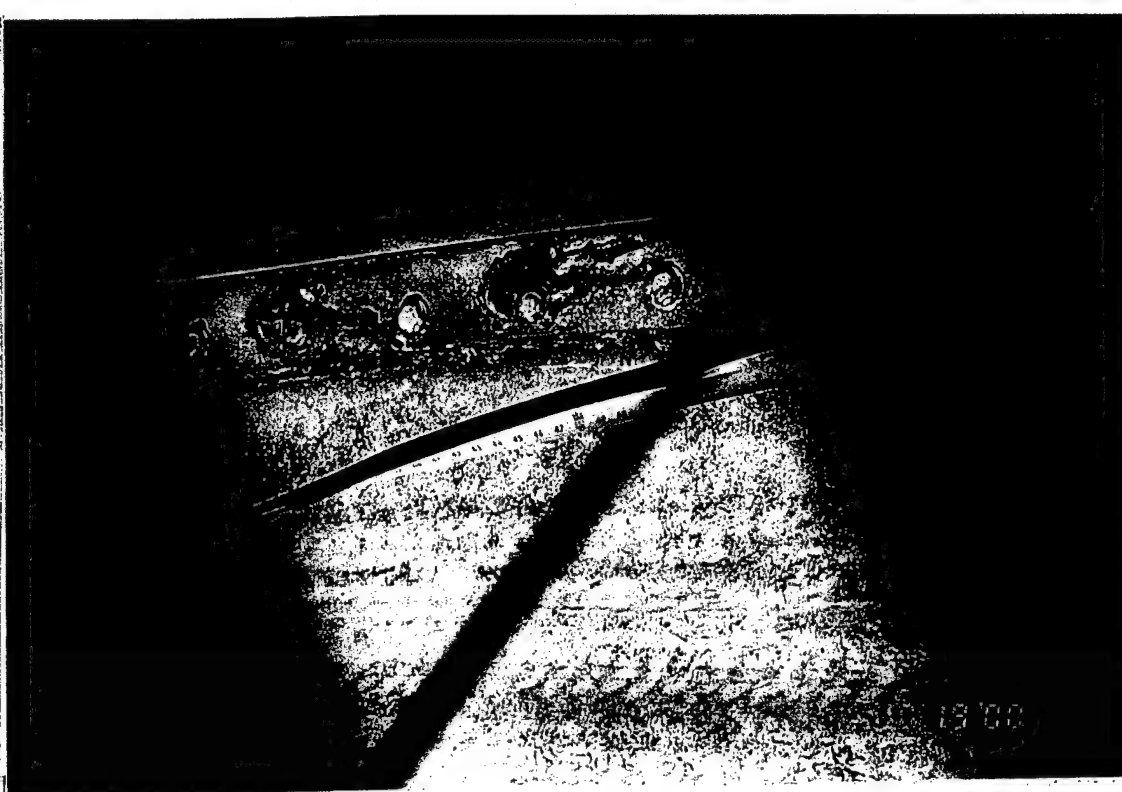


Little  
Goose  
Dam

Gate 4  
Side seal angles, wear plate and side  
seal, typical.

10/19/00

4-34

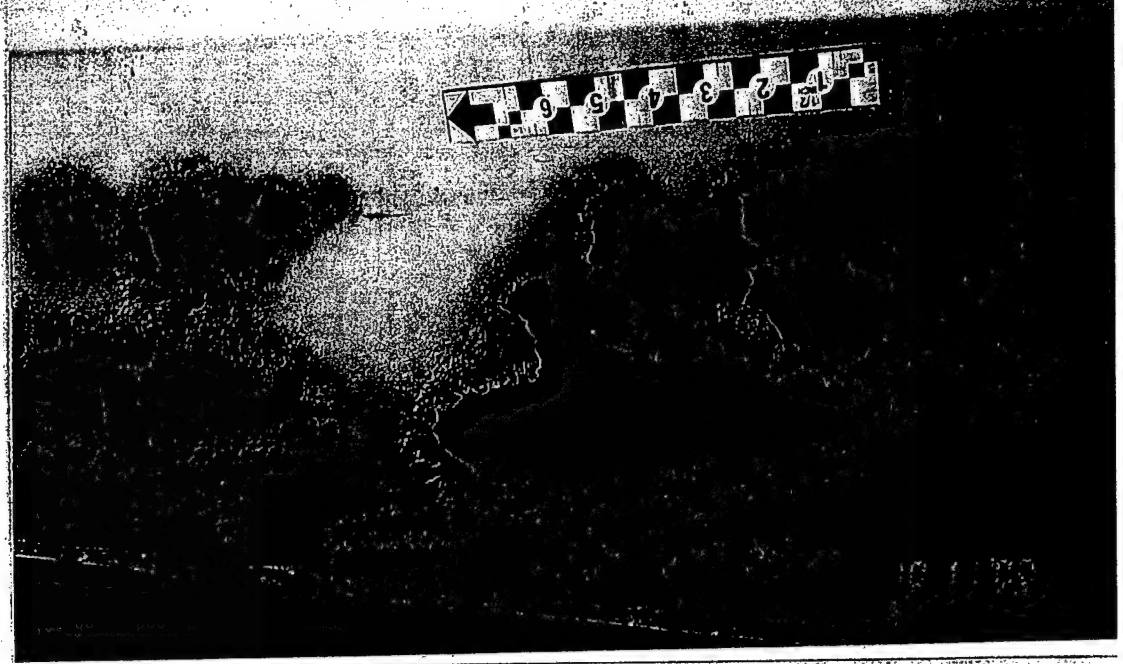


Little  
Goose  
Dam

Gate 4  
Side seal angles, side seal, and side  
seal, typical

10/19/00

4-35



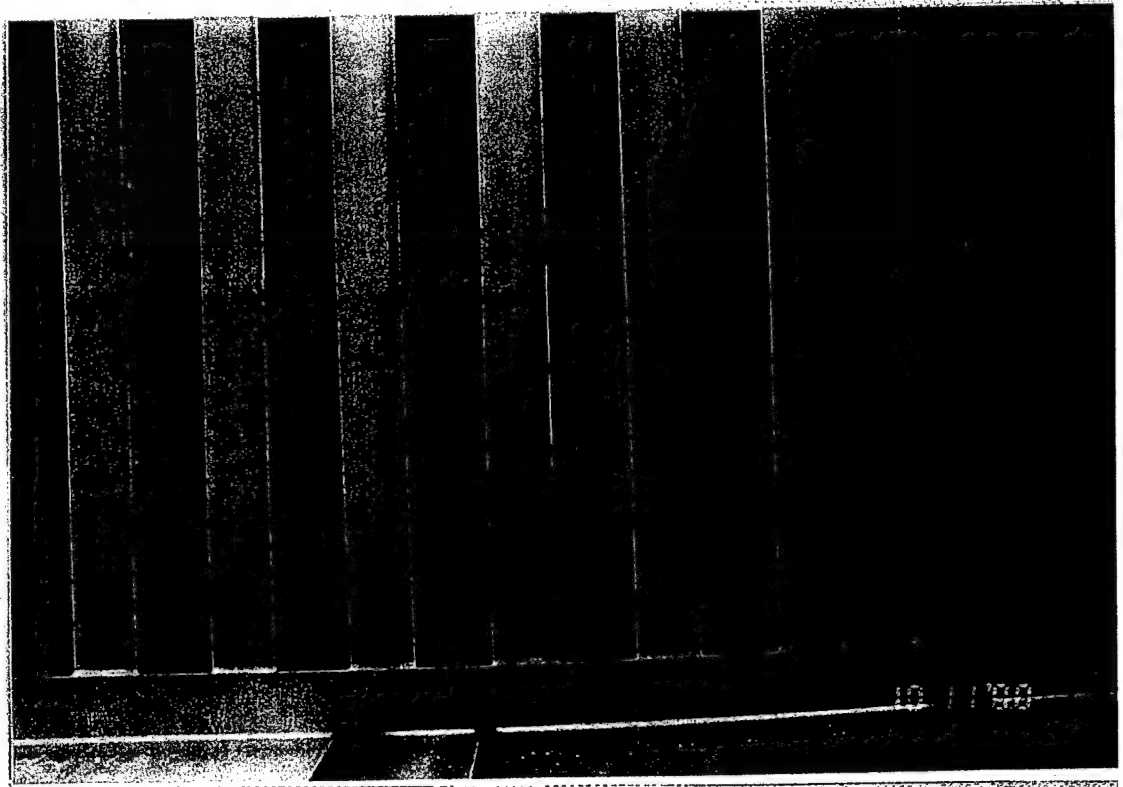
Little  
Goose  
Dam

10/11/00

5-1

#### Gate 5

Downstream side of skin plate, left  
side of gate, above top horiz. girder.  
Peeling paint, light corrosion.  
Appears to be possible paint blister  
due to upstream skin plate welding.



Little  
Goose  
Dam

10/11/00

5-2

#### Gate 5

Downstream side of skin plate, left  
side of gate, above top horiz. girder.  
Peeling paint, light corrosion.  
Appears to be possible paint blister  
due to upstream skin plate welding.



Little  
Goose  
Dam

10/11/00

5-3

**Gate 5**

Top horizontal girder, left side of  
gate. Light corrosion on girder web,  
purlins, braces.



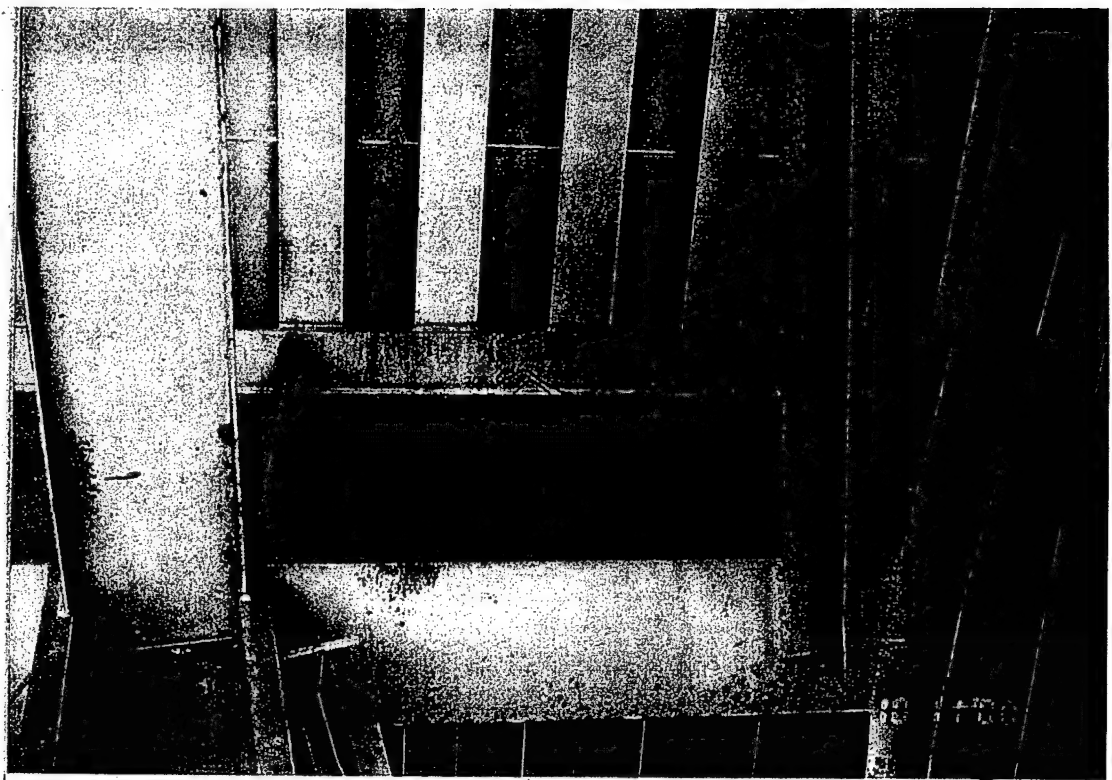
Little  
Goose  
Dam

10/11/00

5-4

**Gate 5**

Left frame, Brace D. light corrosion  
and brace.



Little  
Goose  
Dam

10/11/00

5-5

#### Gate 5

Middle horizontal girder, left end.  
Light corrosion on girder, braces and  
skin plate.



Little  
Goose  
Dam

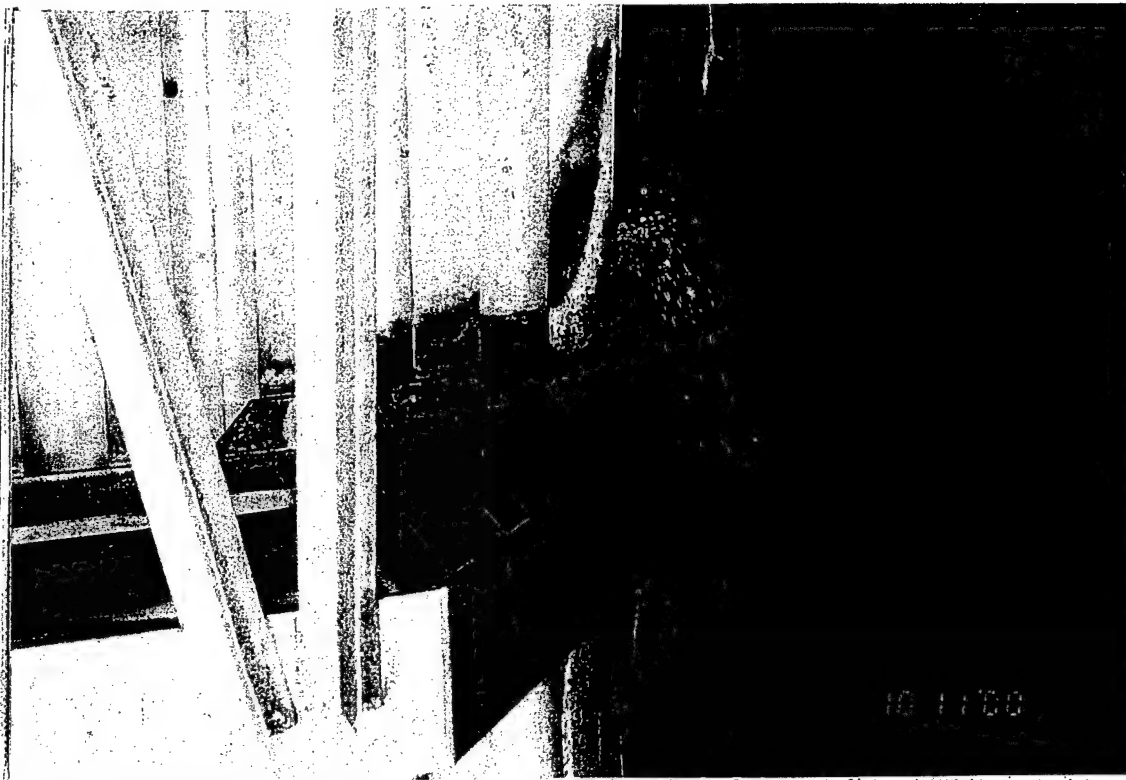
10/11/00

5-6

#### Gate 5

Downstream side of skin plate, left  
side of gate, above middle horiz.  
girder. Peeling pain, light corrosion.  
Appears to be possible paint blister  
due to upstream skin plate welding.





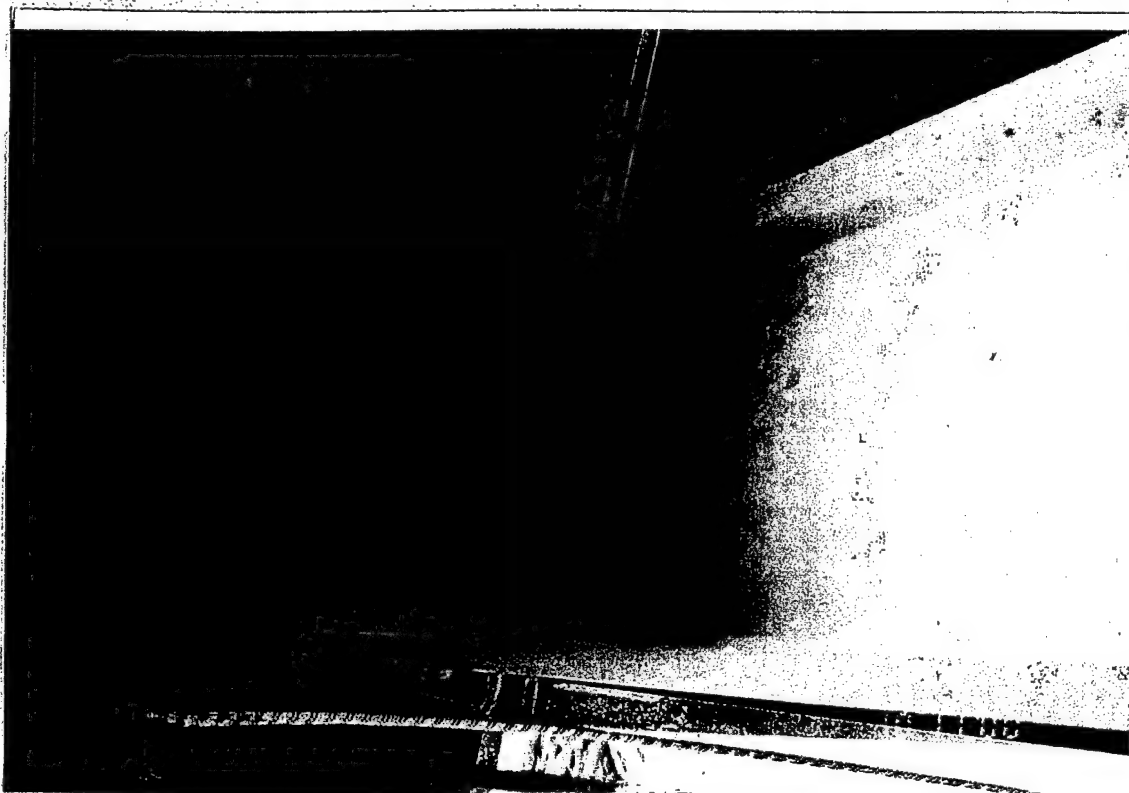
Little  
Goose  
Dam

10/11/00

5-7

#### Gate 5

Bottom horizontal girder, left end.  
Standing water, no drainage between  
multiple stiffeners, typical.



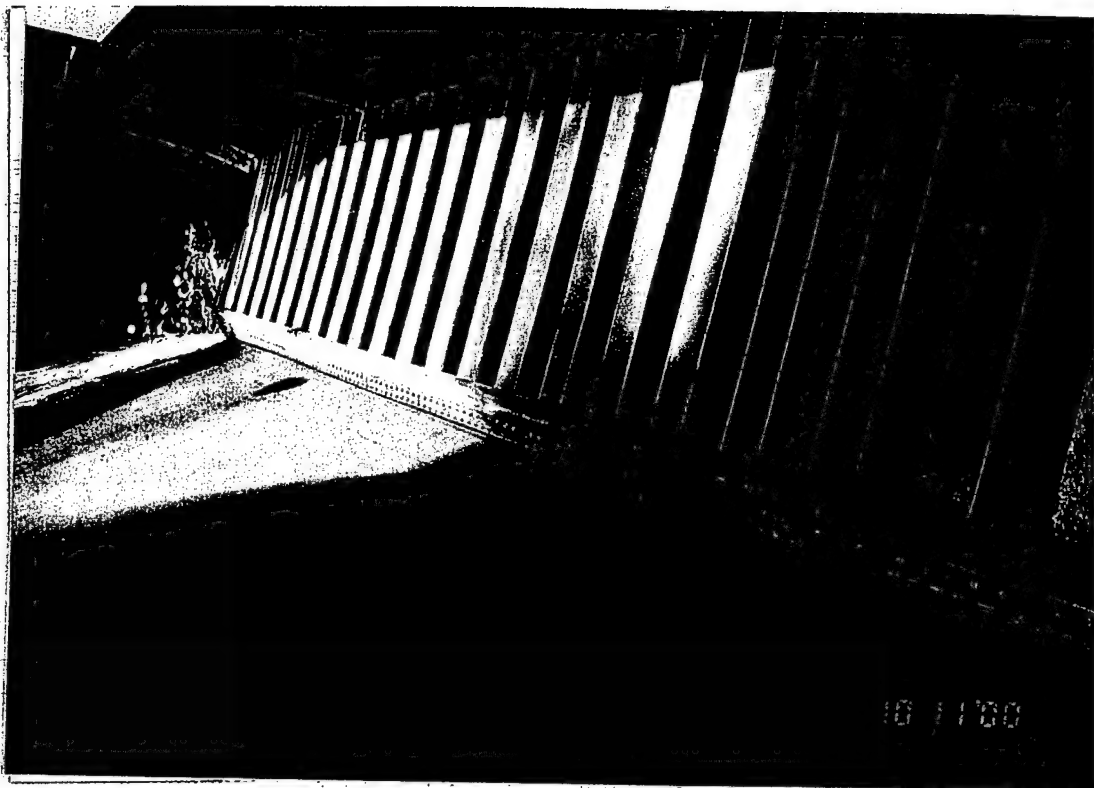
Little  
Goose  
Dam

10/11/00

5-8

#### Gate 5

Let frame, Brace J. Light corrosion  
on bottom radial strut and brace.



Little  
Goose  
Dam

Gate 5  
Leak at center construction joint in  
spillway monolith.

10/11/00

5-9



Little  
Goose  
Dam

Gate 5  
Bottom left corner of gate, bottom  
seal leak. Bottom seal closure plate.  
Standing water between closure plate,  
purlin webs and skinplate, typical.

10/11/00

5-10



Little  
Goose  
Dam

10/11/00

5-11

**Gate 5**

Bottom seal closure plate. Standing  
water between closure plate, purlin  
webs and skinplate, typical.



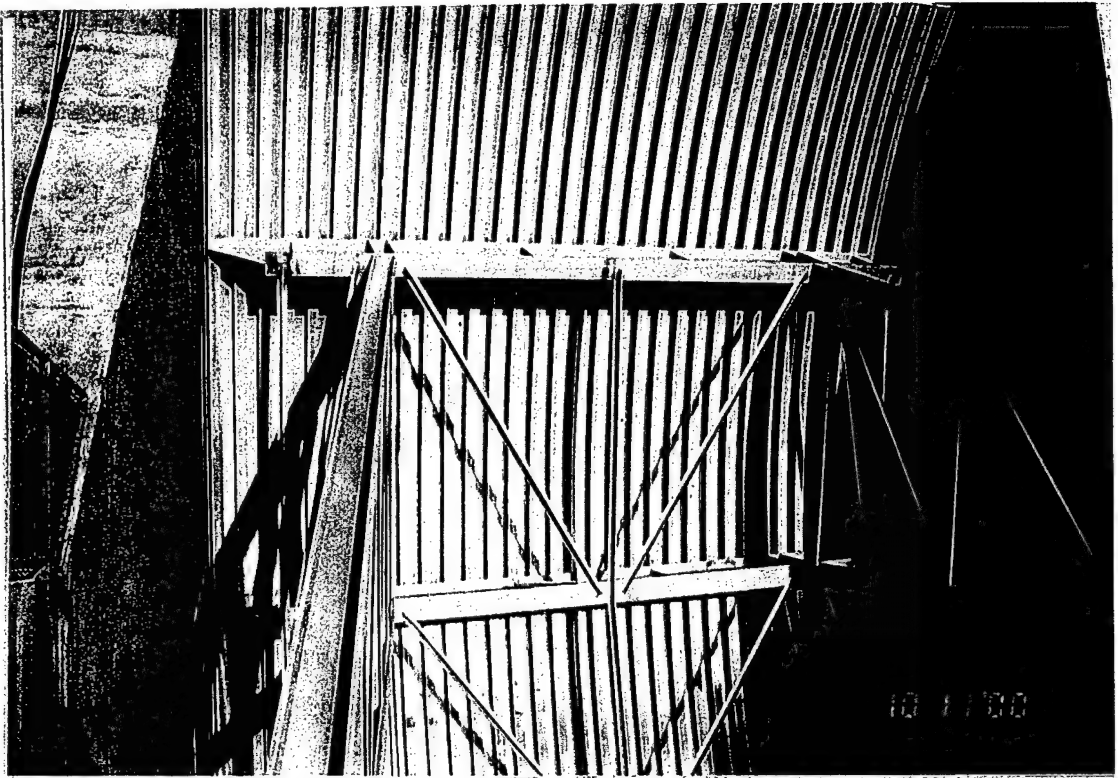
Little  
Goose  
Dam

10/11/00

5-12

**Gate 5**

Left frame, typical.

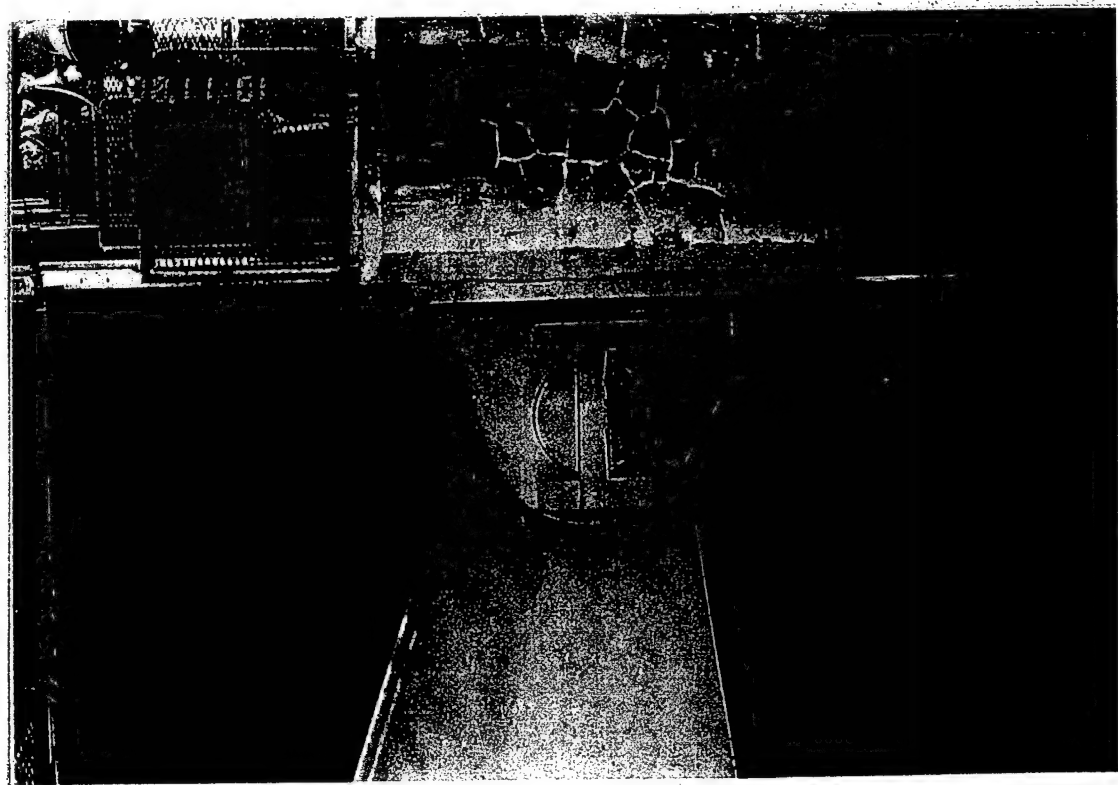


Little  
Goose  
Dam

Gate 5  
Gate face, typical.

10/11/00

5-13

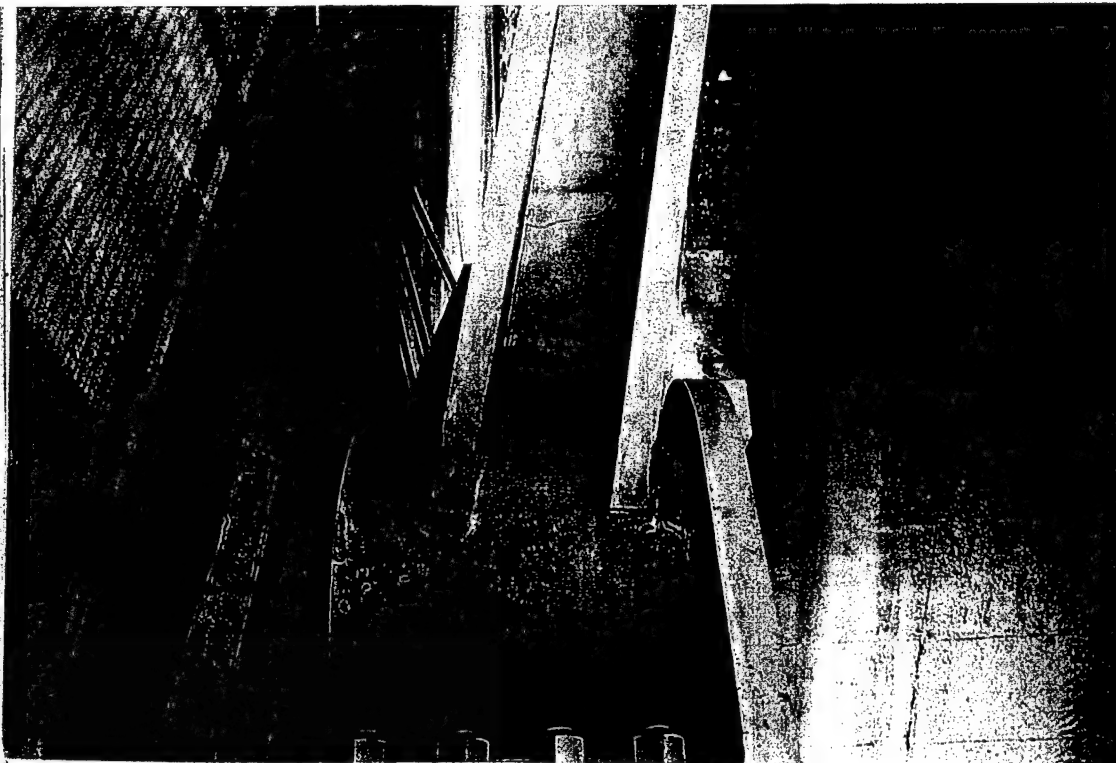


Little  
Goose  
Dam

Gate 5  
Left trunnion block. Light cracking  
in concrete.

10/11/00

5-14

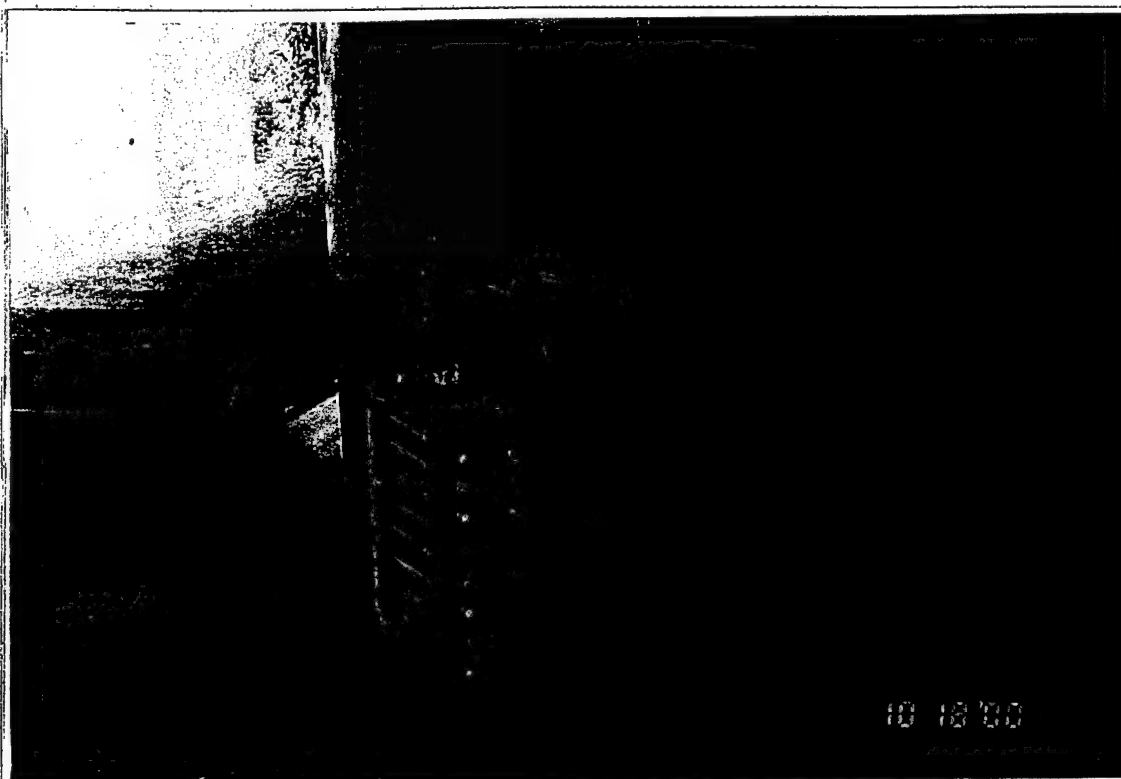


Little  
Goose  
Dam

10/11/00

5-15

**Gate 5**  
Top of right trunnion. Standing  
water due to inadequate drainage in  
top radial strut web.



Little  
Goose  
Dam

10/18/00

5-16

**Gate 5**  
Top of right hoist connection. Light  
corrosion on lifting lugs and plates.

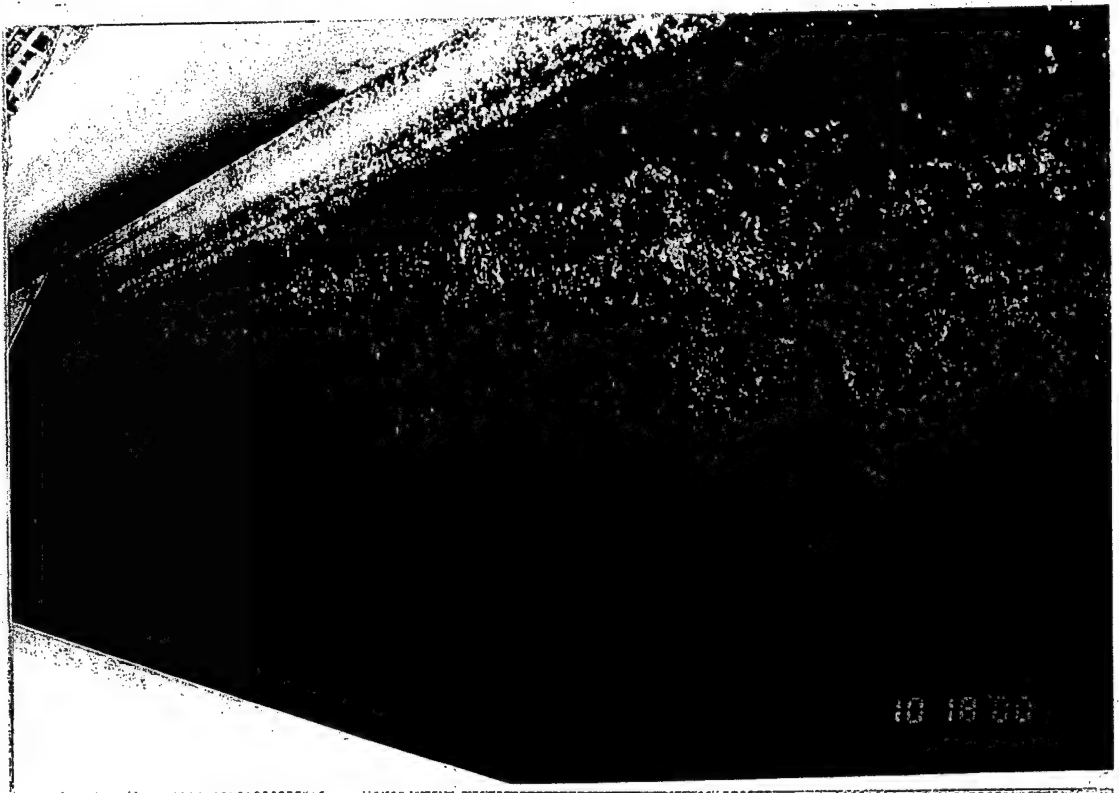


Little  
Goose  
Dam

Gate 5

10/11/00

5-17



Little  
Goose  
Dam

Gate 5

10/11/00

5-18



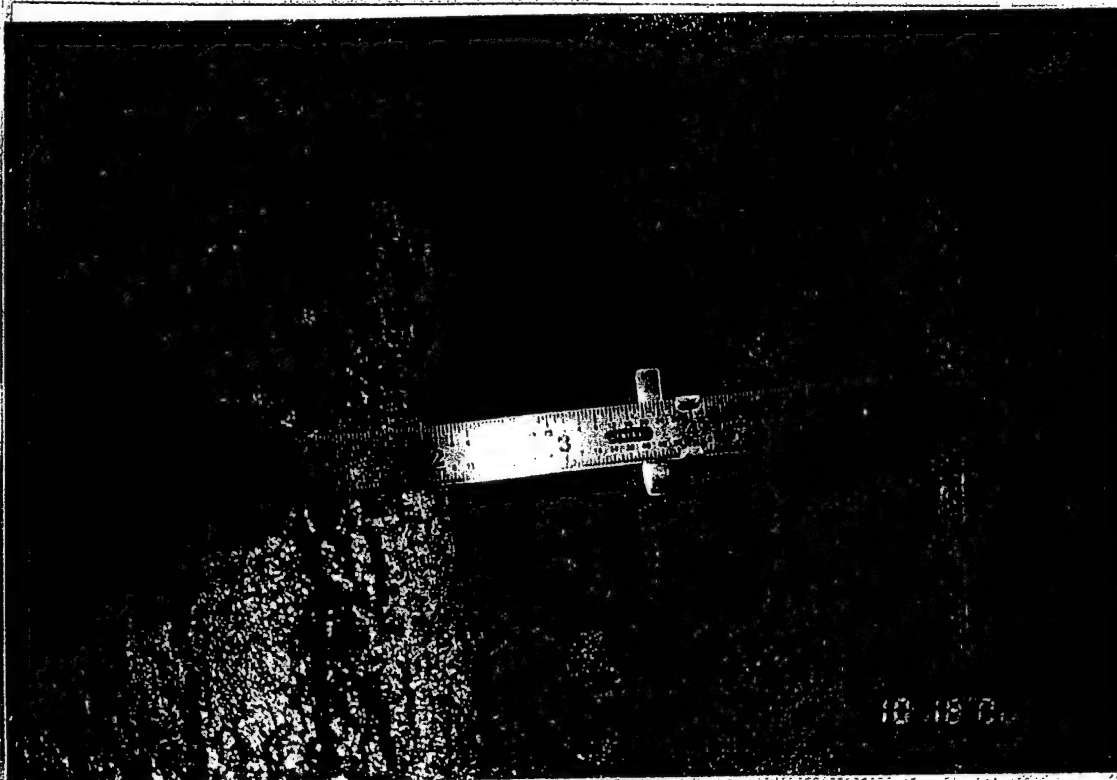


Little  
Goose  
Dam

Gate 5

10/11/00

5-19



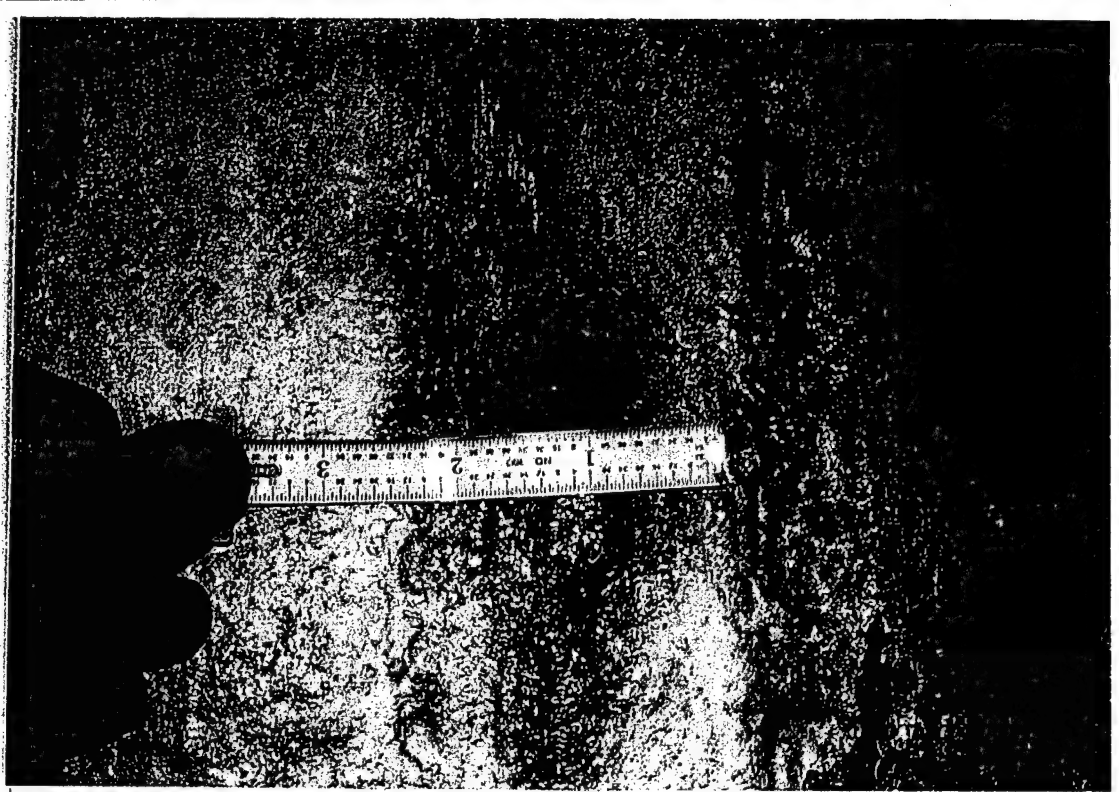
Little  
Goose  
Dam

Gate 5

10/11/00

5-20



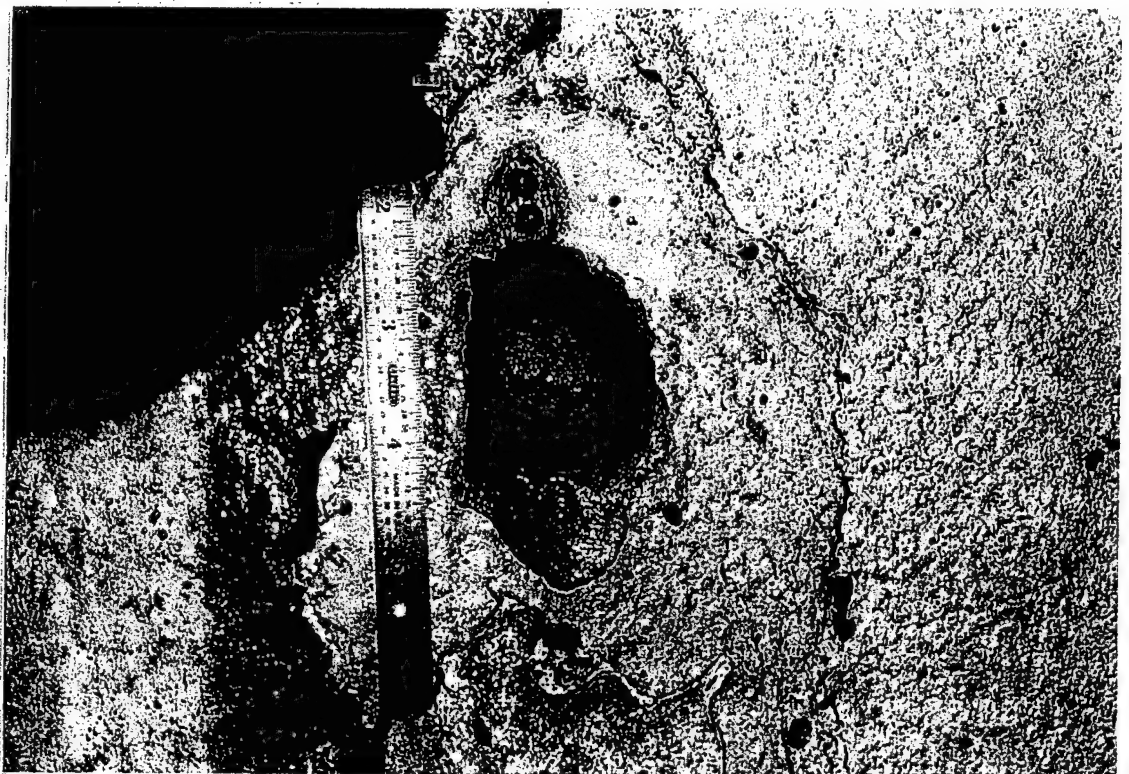


Little  
Goose  
Dam

**Gate 5**  
Bottom seal keeper plate, typical.

10/18/00

5-21

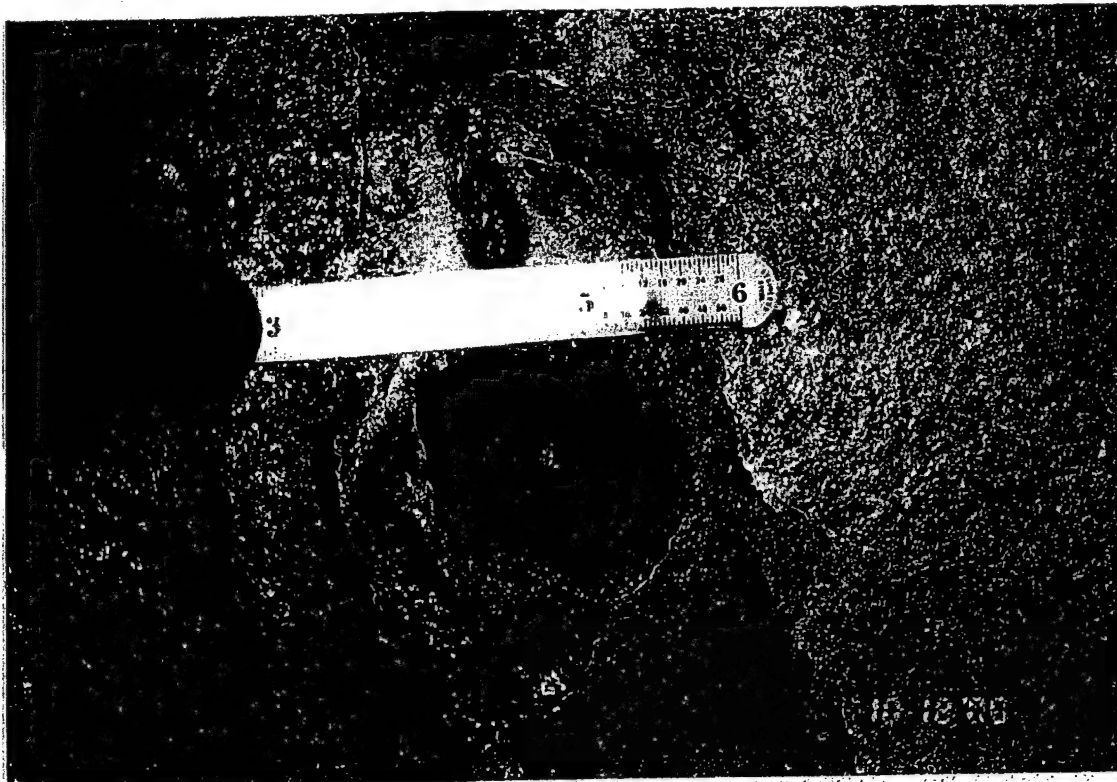


Little  
Goose  
Dam

**Gate 5**  
Waterblasting and typical skin plate  
condition. Minimal pitting on skin  
plate (except for wear plates).

10/18/00

5-22



Little  
Goose  
Dam

10/18/00

5-23

**Gate 5**

Heavy pitting on wear plate, typical.



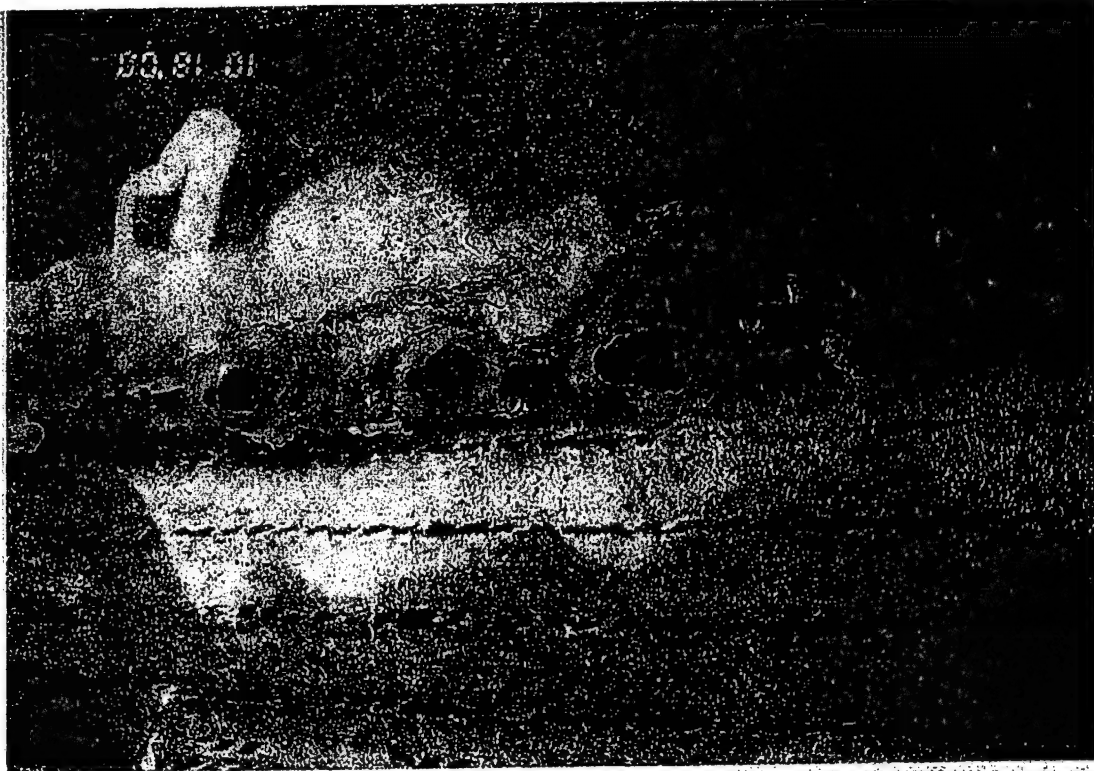
Little  
Goose  
Dam

10/18/00

5-24

**Gate 5**

Heavy pitting on wear plate, typical.

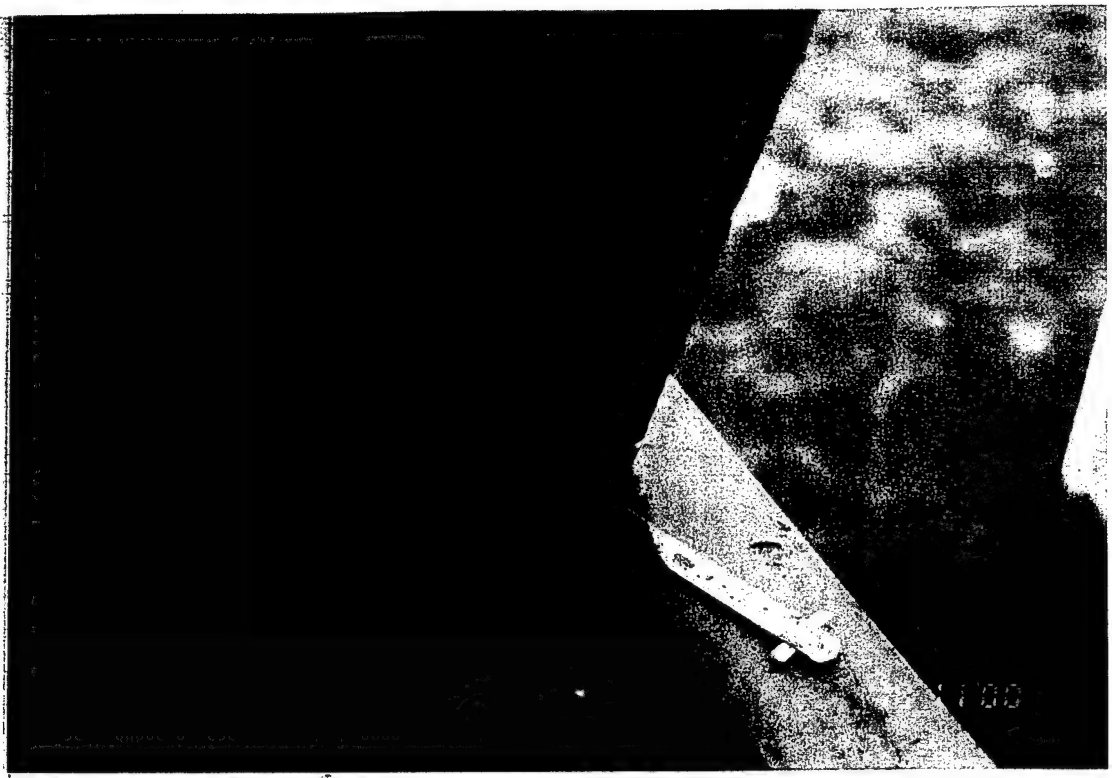


Little  
Goose  
Dam

**Gate 5**  
Heavy pitting on wear plate, typical.

10/18/00

5-25



Little  
Goose  
Dam

10/11/00

6-1

Gate 6  
Left frame, Brace B. Light corrosion  
on brace (see photo 6-2).

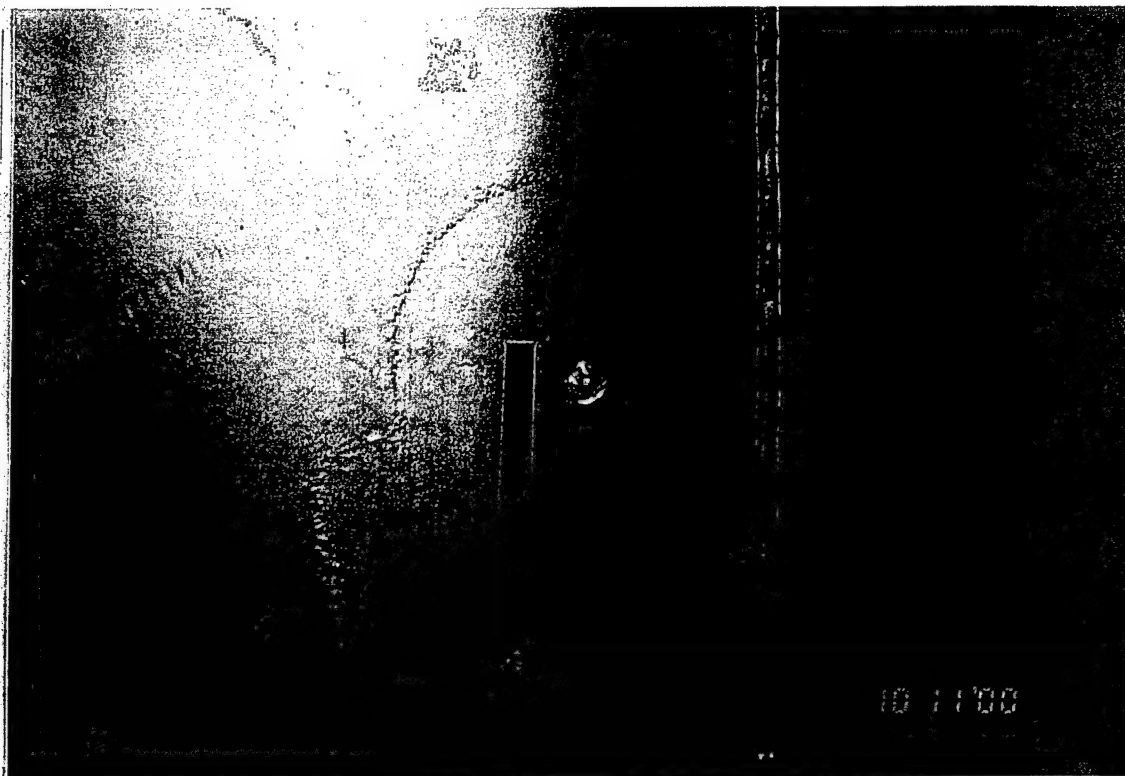


Little  
Goose  
Dam

10/11/00

6-2

Gate 6  
Left frame, Brace B. Light corrosion  
on brace.



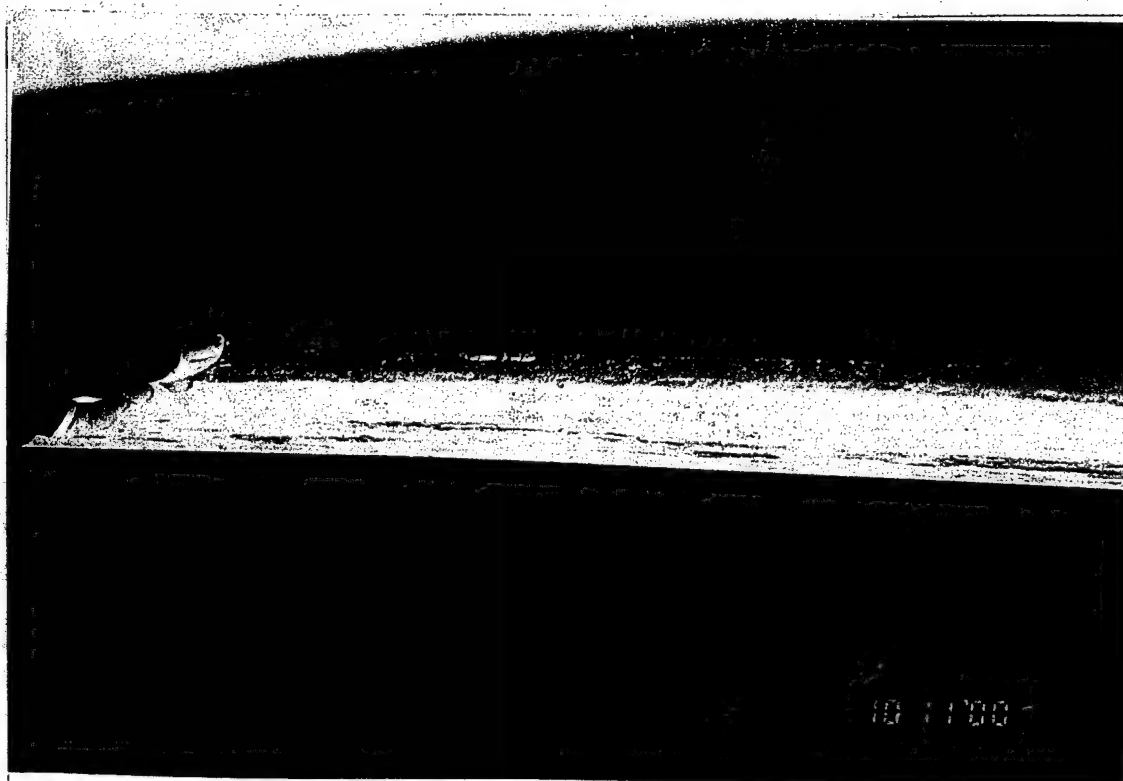
Little  
Goose  
Dam

10/11/00

6-3

#### Gate 6

Downstream side of skin plate, left  
side of gate, above middle horizontal  
girder. Apparent skin plate repair.



Little  
Goose  
Dam

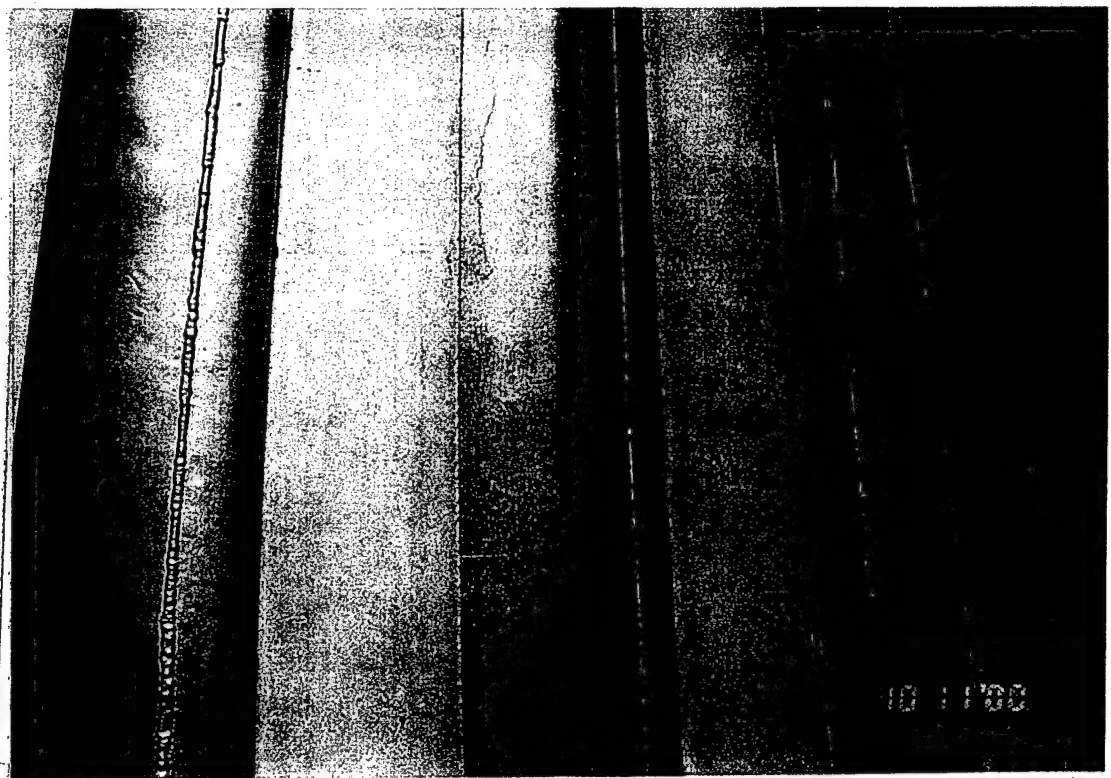
10/11/00

6-4

#### Gate 6

Left frame, brace D. Light corrosion.



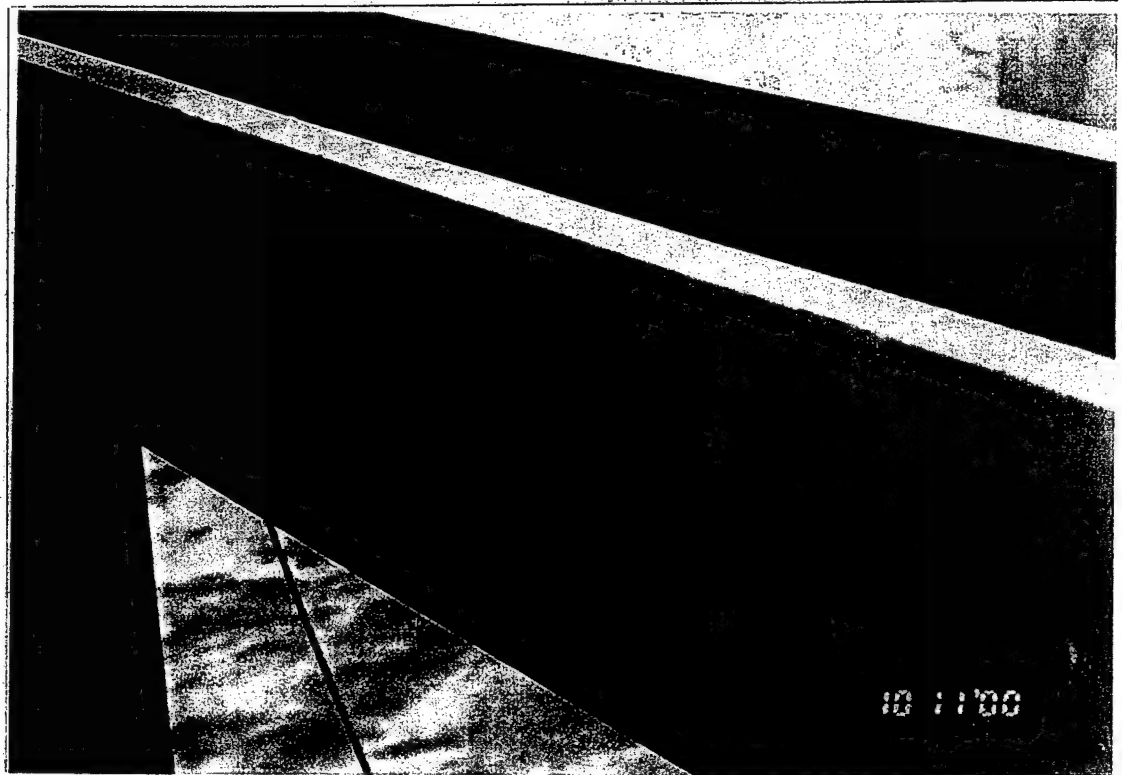


Little  
Goose  
Dam

10/11/00  
6-5

**Gate 6**

Downstream side of skin plate, left side of gate, above middle horizontal girder. Discolorization due to apparent repainting and possible skin plate repair.



Little  
Goose  
Dam

10/11/00  
6-6

**Gate 6**

Left frame, middle radial strut. Light pitting on outside flange.



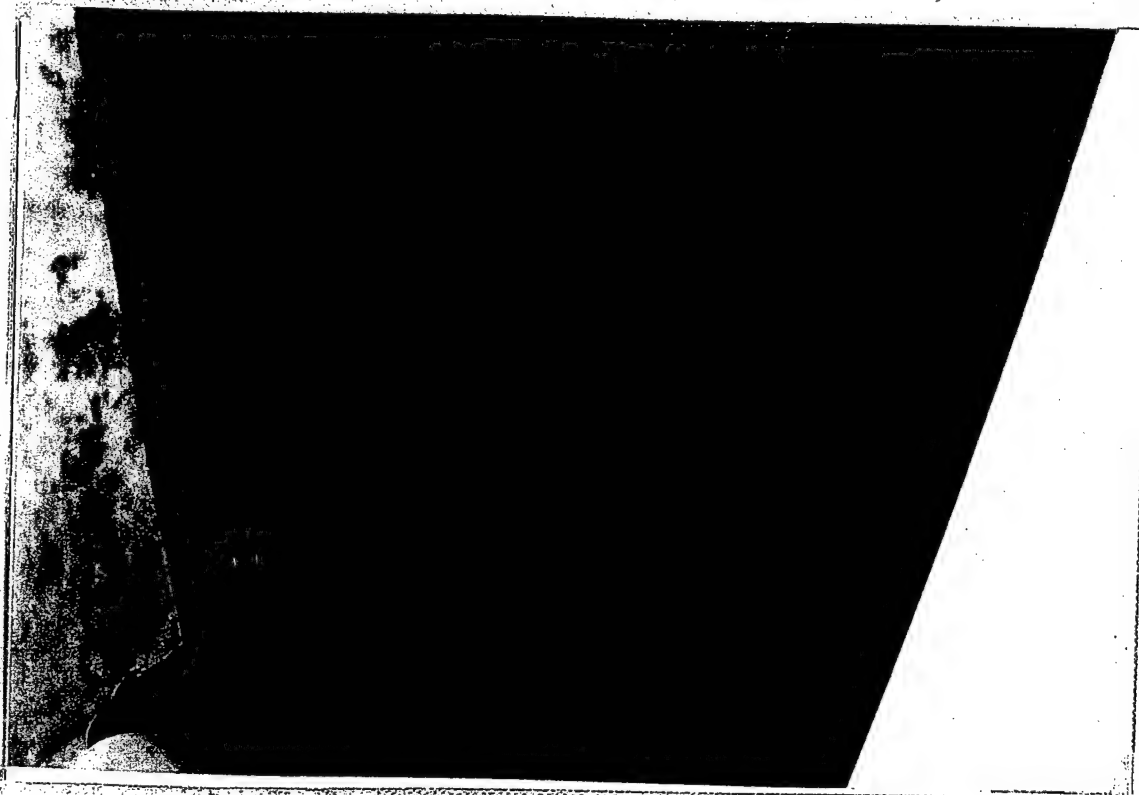
Little  
Goose  
Dam

10/11/00

6-7

**Gate 6**

Downstream side of skin plate,  
apparent skin plate repair grinding.



Little  
Goose  
Dam

10/11/00

6-8

**Gate 6**

Light corrosion and debris coating on  
braces, typical.





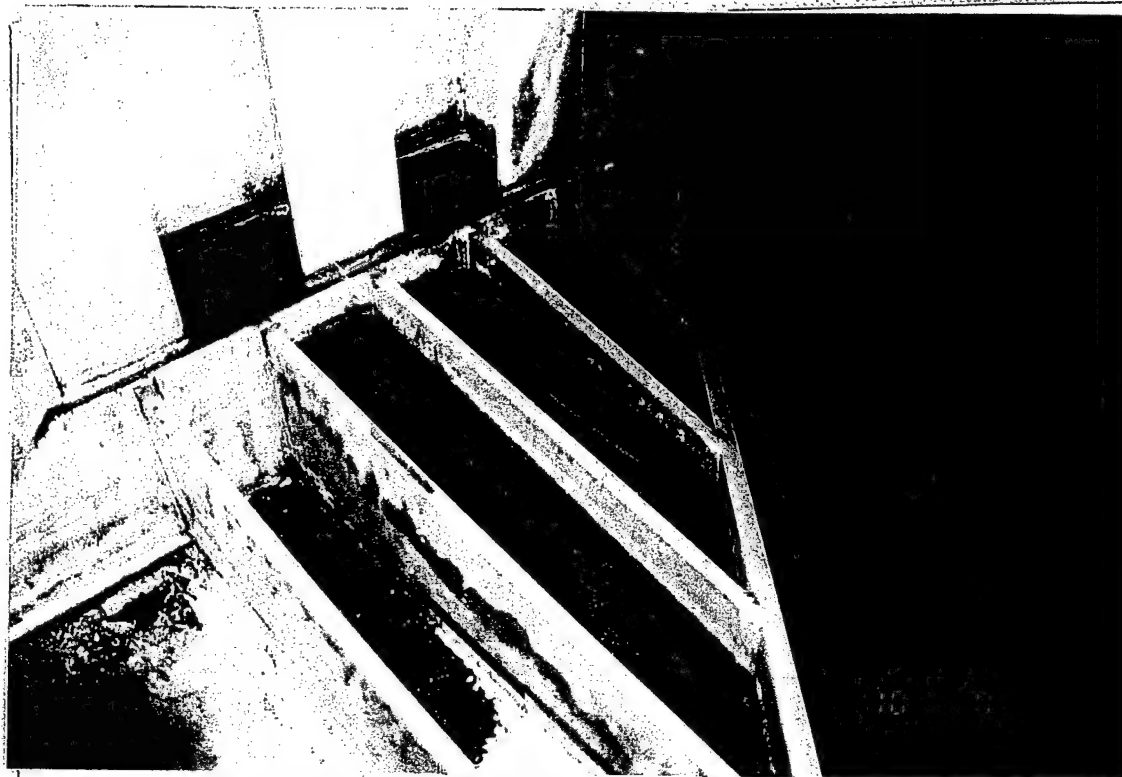
Little  
Goose  
Dam

10/11/00

6-9

#### Gate 6

Gate face and spillway, typical. Leak at center construction joint in spillway monolith.



Little  
Goose  
Dam

10/11/00

6-10

#### Gate 6

Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



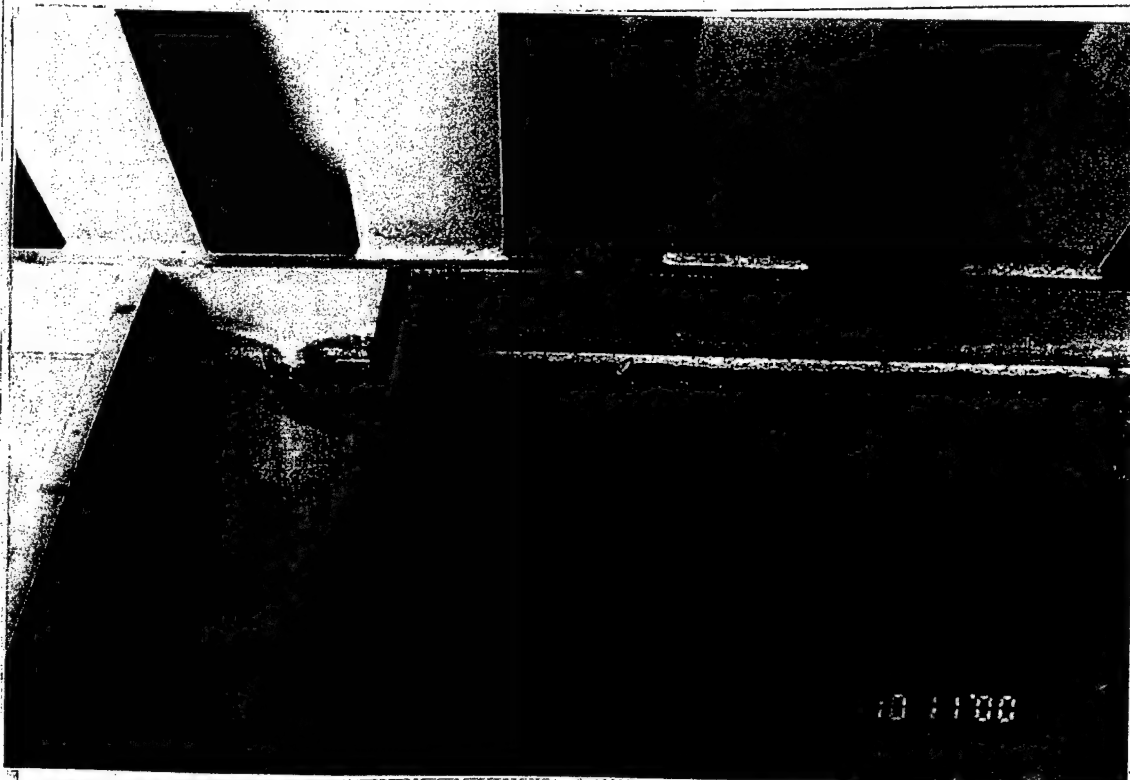
Little  
Goose  
Dam

10/11/00

6-11

#### Gate 6

Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



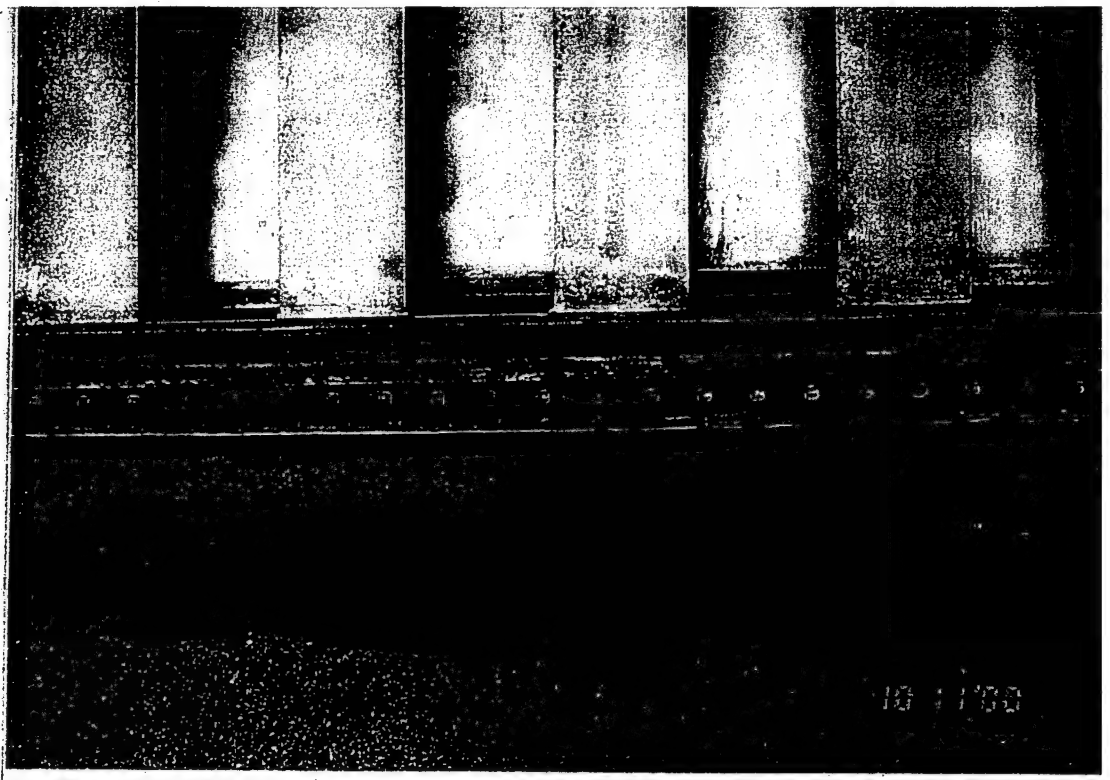
Little  
Goose  
Dam

10/11/00

6-12

#### Gate 6

Bottom horizontal girder. Evidence of standing water on girder web and flange.



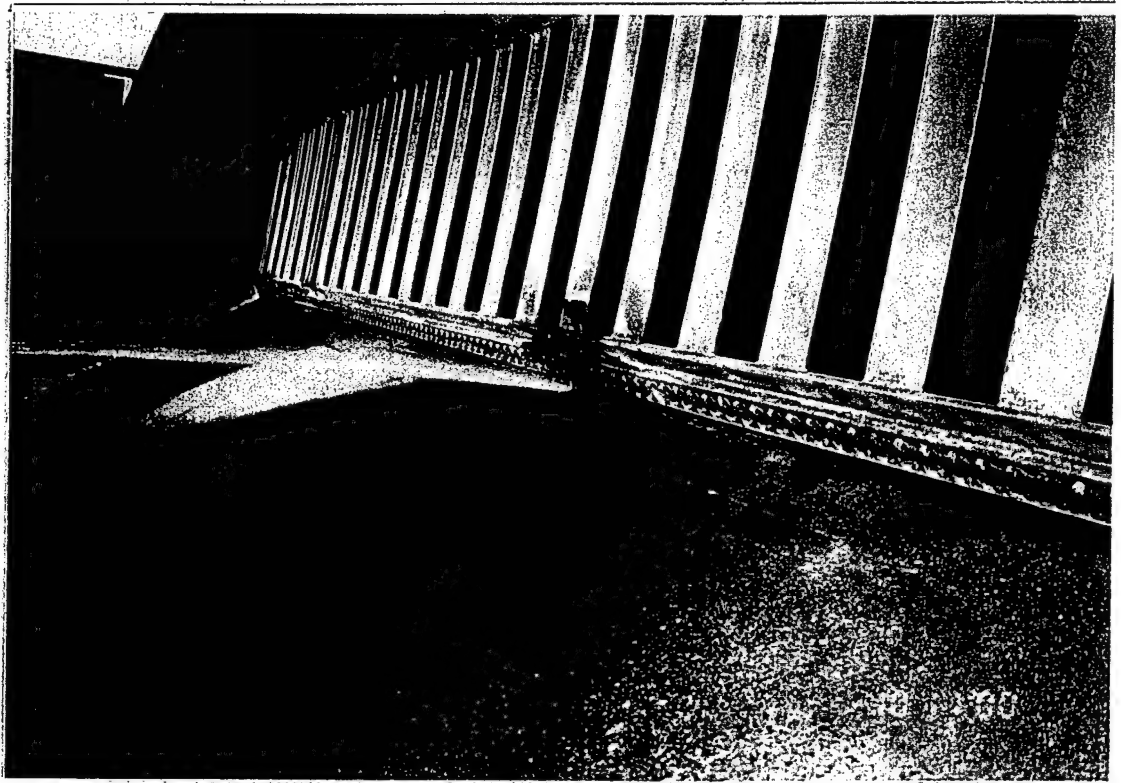
Little  
Goose  
Dam

10/11/00

6-13

**Gate 6**

Bottom seal keeper plate, typical.  
Bottom seal closure plate, standing  
water between closure plate, purlin  
webs and skinplate, typical.



Little  
Goose  
Dam

10/11/00

6-14

**Gate 6**

Leak at center construction joint in  
spillway monolith.



Little  
Goose  
Dam

10/11/00

6-15

**Gate 6**

Bottom seal closure plate, standing  
water between closure plate, purlin  
webs and skinplate, typical.



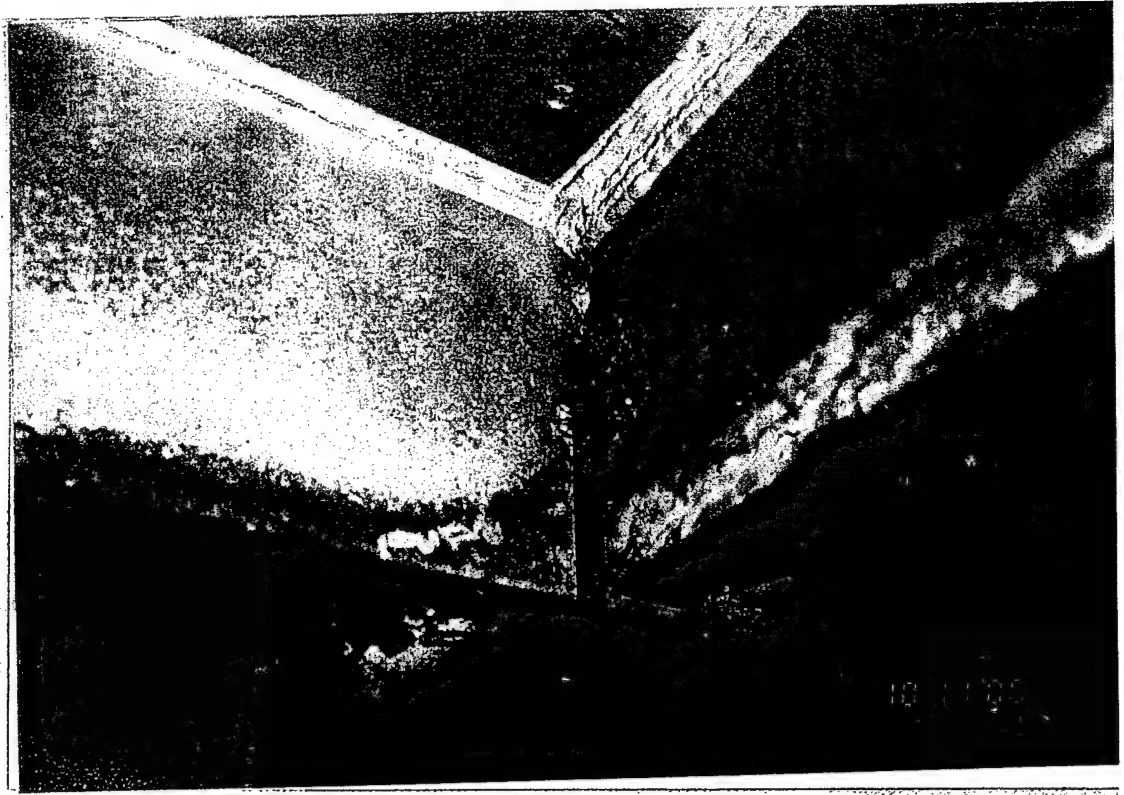
Little  
Goose  
Dam

10/11/00

6-16

**Gate 6**

Bottom of bottom horizontal girder  
at radial strut connection and girder  
drain hole. Light corrosion on girder  
web and stiffeners.



Little  
Goose  
Dam

10/11/00

6-17

**Gate 6**

Bottom of bottom horizontal girder  
at radial strut connection and girder  
drain hole. Light corrosion on girder  
web and stiffeners.



Little  
Goose  
Dam

10/11/00

6-18

**Gate 6**

Leak at center construction joint in  
spillway monolith. Light corrosion  
on bottom seal keeper plate.



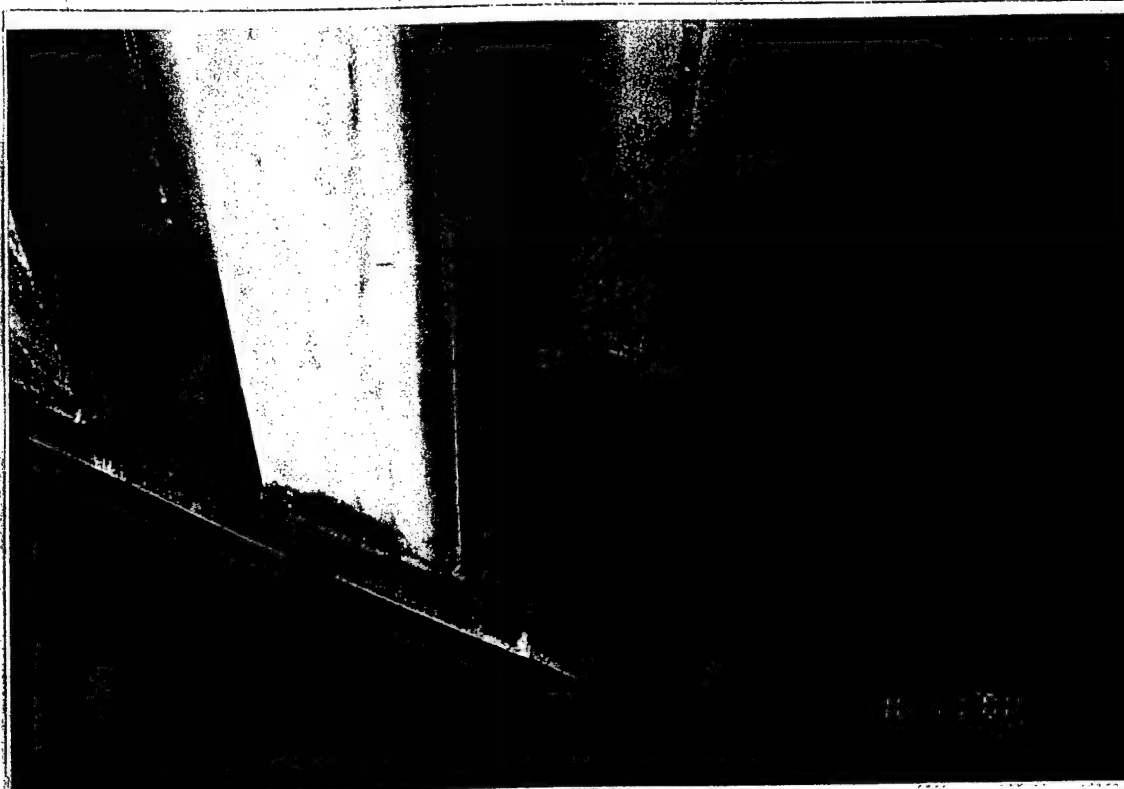
Little  
Goose  
Dam

10/11/00

6-19

#### Gate 6

Bottom of bottom horizontal girder  
at radial strut connection and girder  
drain hole. Light corrosion on girder  
web and stiffeners.



Little  
Goose  
Dam

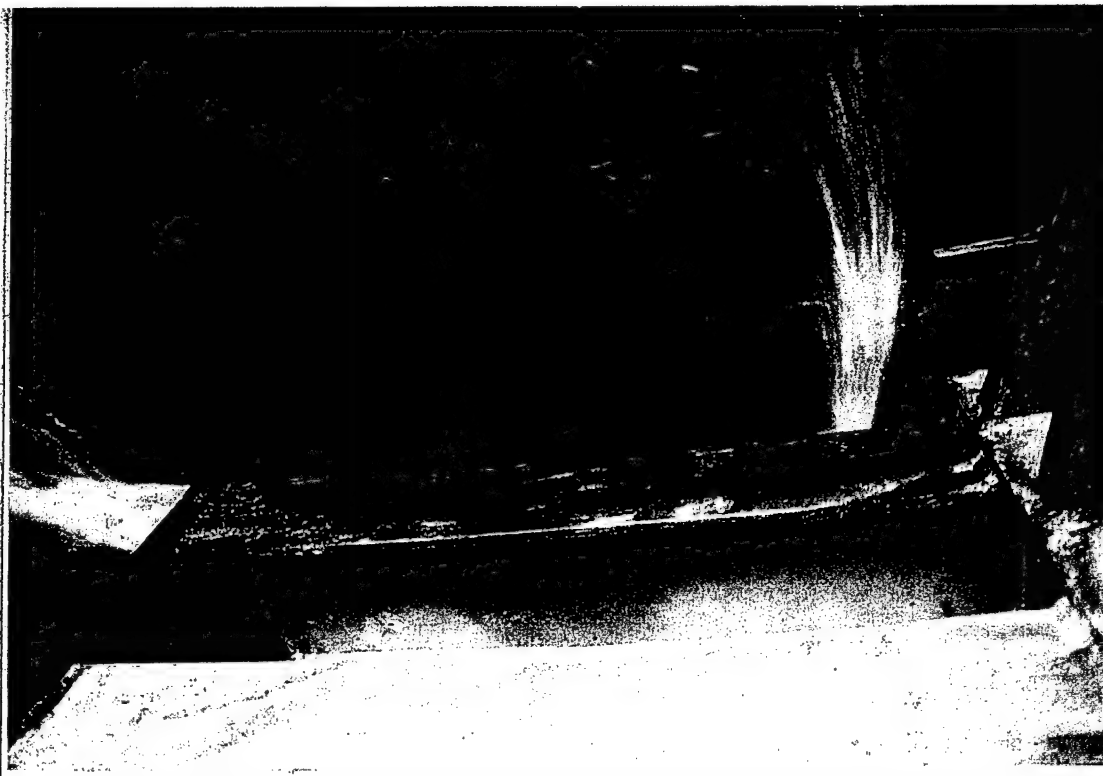
10/11/00

6-20

#### Gate 6

Bottom seal closure plate, standing  
water between closure plate, purlin  
webs and skinplate, typical.





Little  
Goose  
Dam  
10/11/00  
6-21

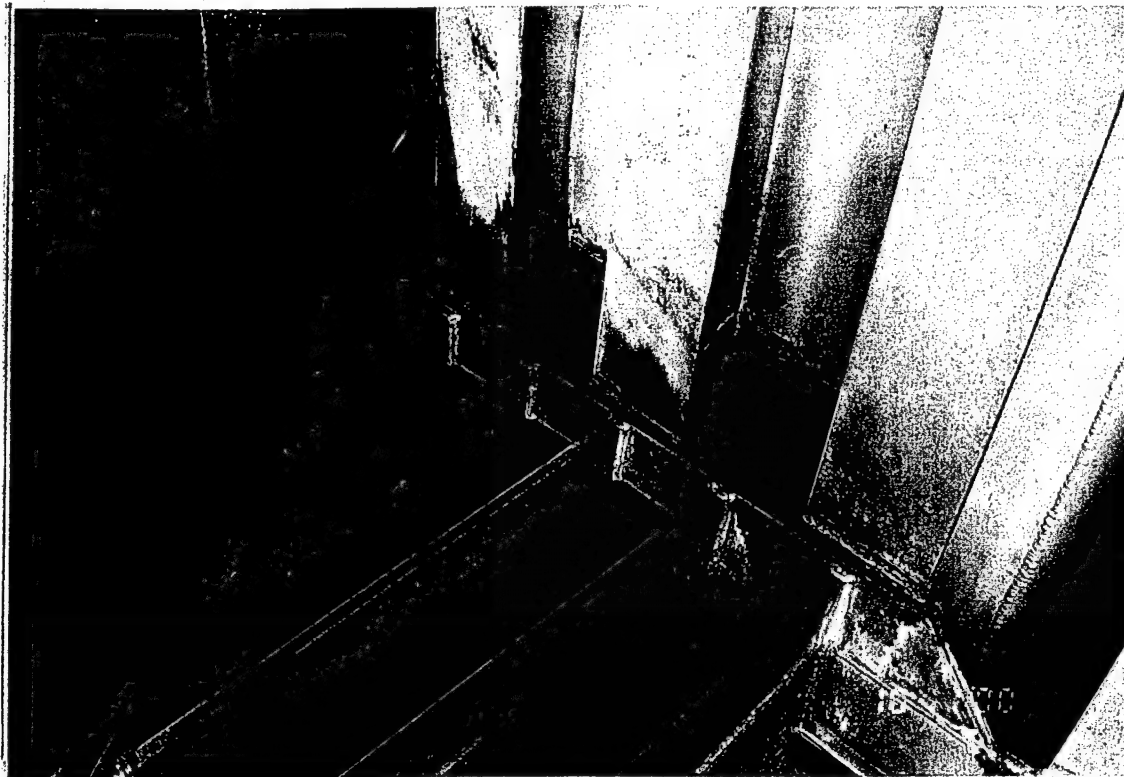
Gate 6  
Side seal leak, bottom left side of  
gate. Light corrosion on purlin,  
horizontal girder and girder  
stiffeners.



Little  
Goose  
Dam  
10/11/00  
6-22

Gate 6  
Side seal leak, bottom right side of  
gate. Light corrosion on purlin,  
horizontal girder and girder  
stiffeners.





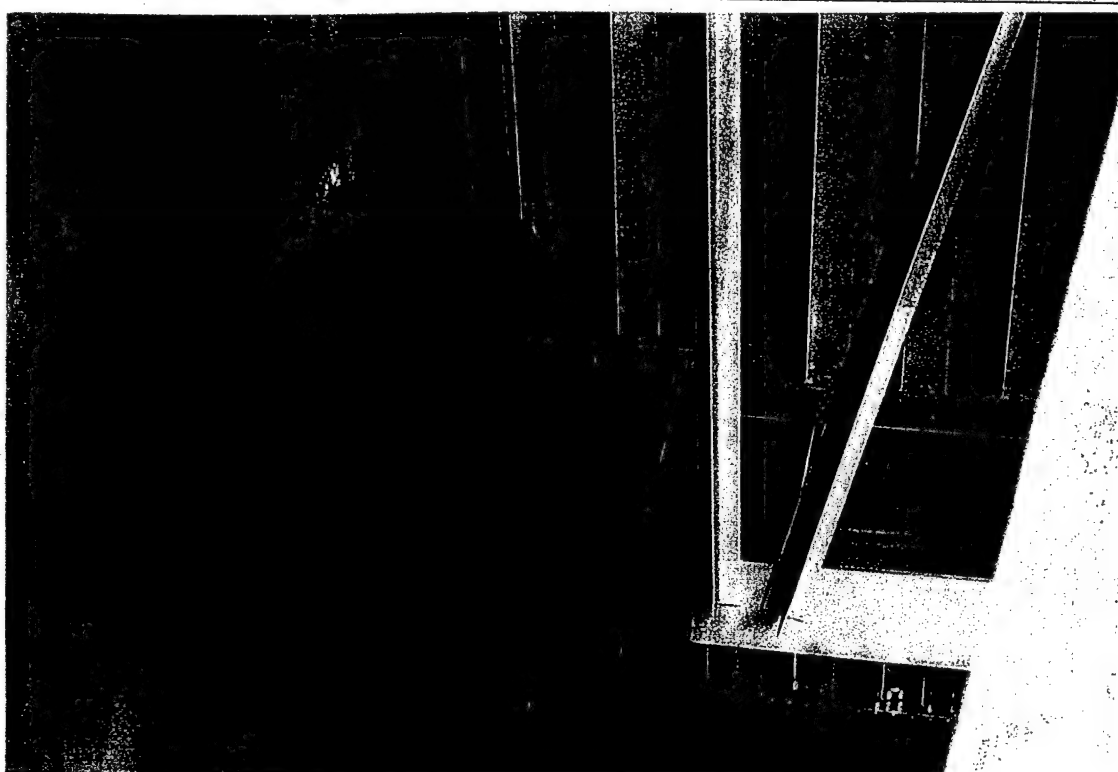
Little  
Goose  
Dam

10/11/00

6-23

#### Gate 6

Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



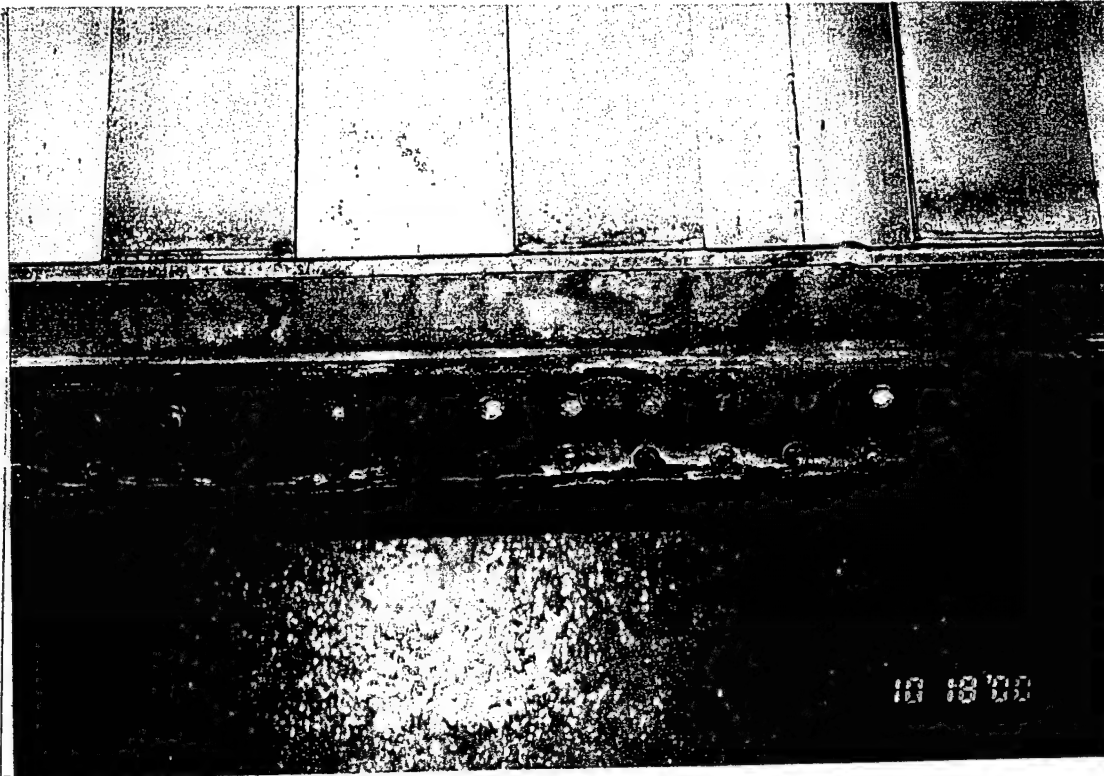
Little  
Goose  
Dam

10/11/00

6-24

#### Gate 6

Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



Little  
Goose  
Dam

Gate 6  
Bottom seal keeper plate, typical.

10/18/00

6-25

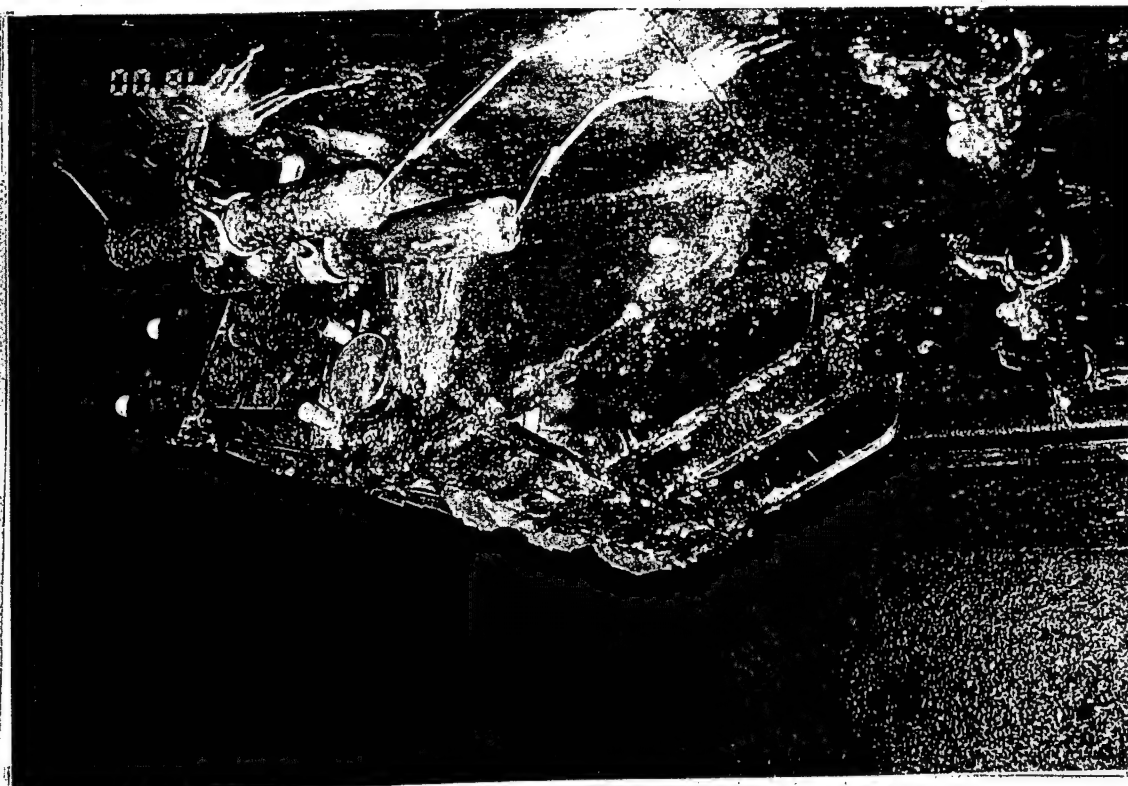


Little  
Goose  
Dam

Gate 6  
Bottom seal keeper plate, typical.

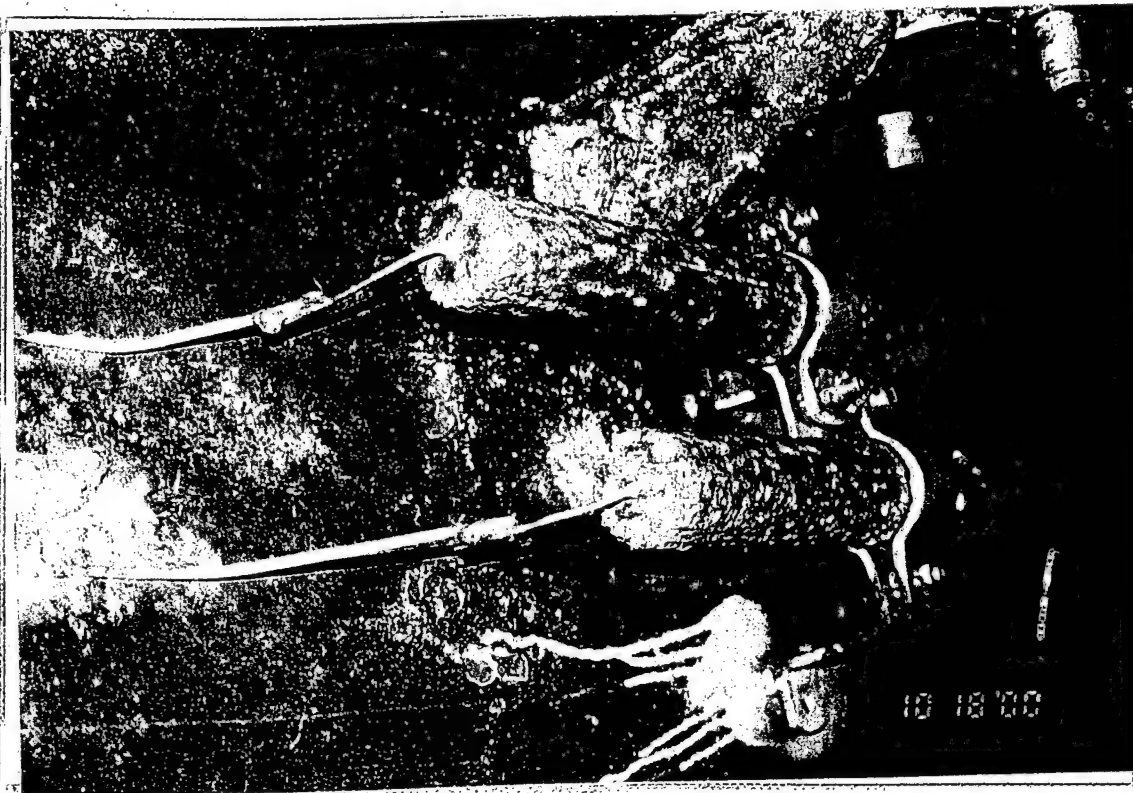
10/18/00

6-26



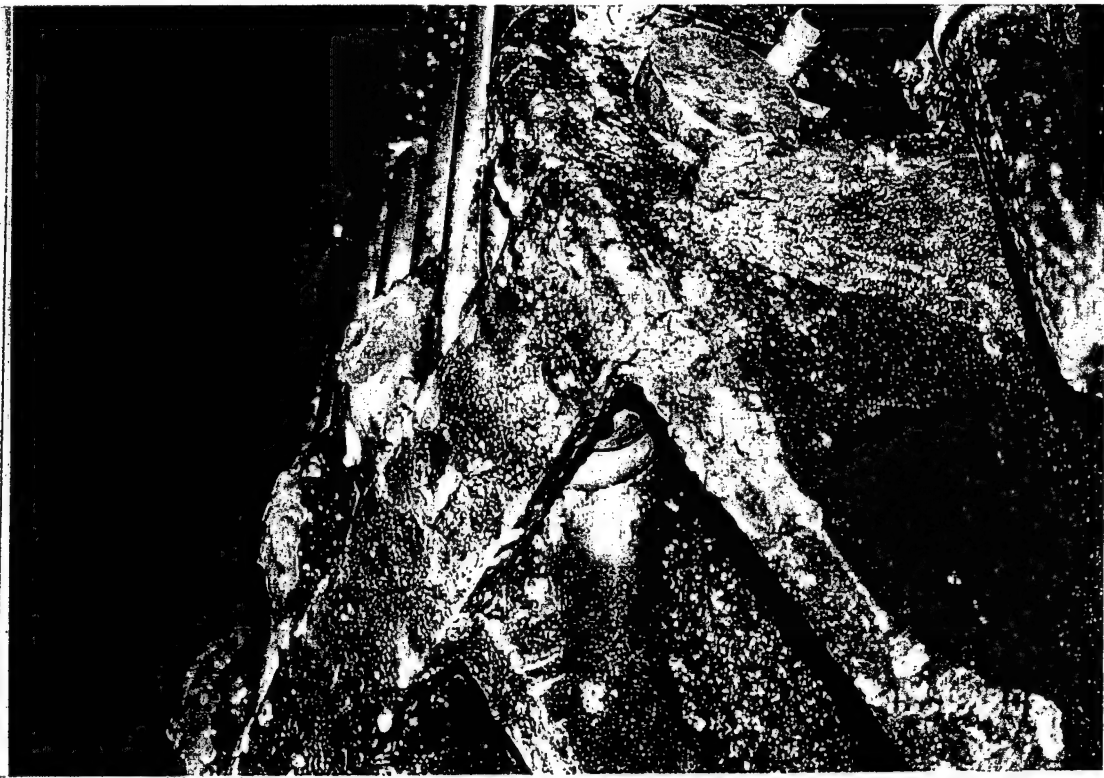
Little  
Goose  
Dam  
10/18/00  
6-27

Gate 6  
Left hoist connection and anodes.  
Light to moderate corrosion on  
lifting lugs and plates. Note: Extra  
anode under hoist connection not  
found on other gates.



Little  
Goose  
Dam  
10/18/00  
6-28

Gate 6  
Hoist connection anodes, typical.

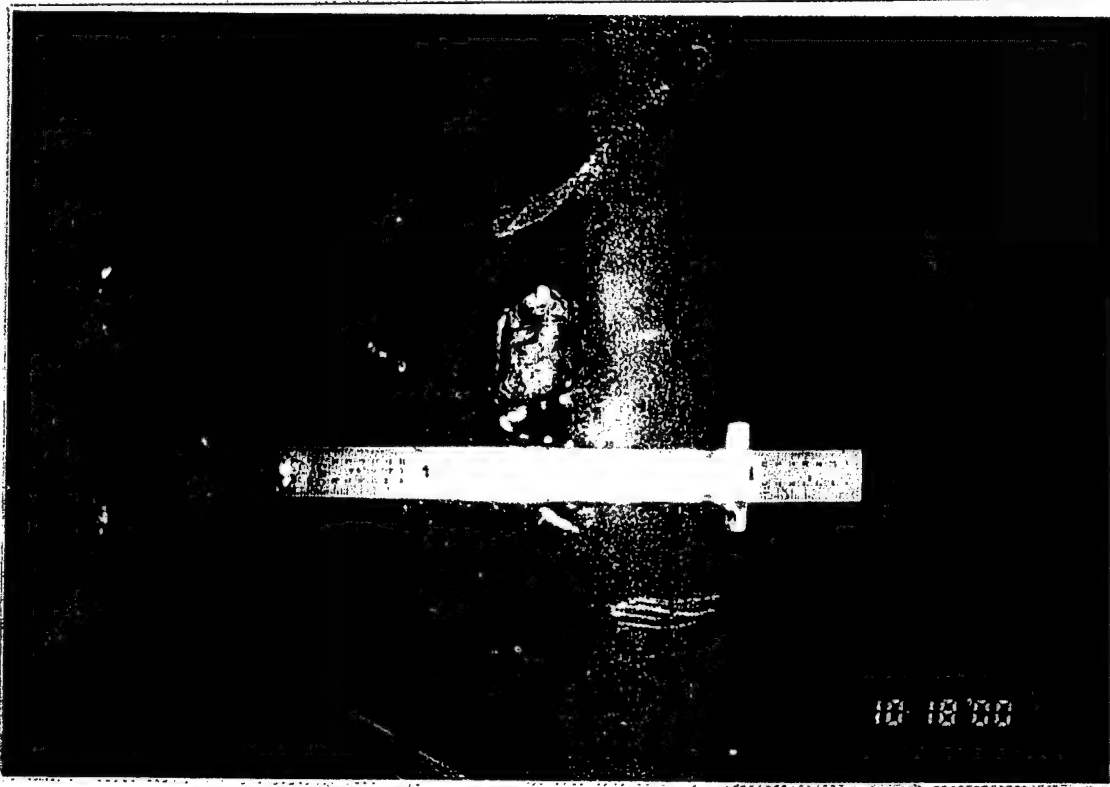


Little  
Goose  
Dam

10/18/00

6-29

**Gate 6**  
Close-up hoist connection. Light to moderate corrosion on lifting lugs and plates.

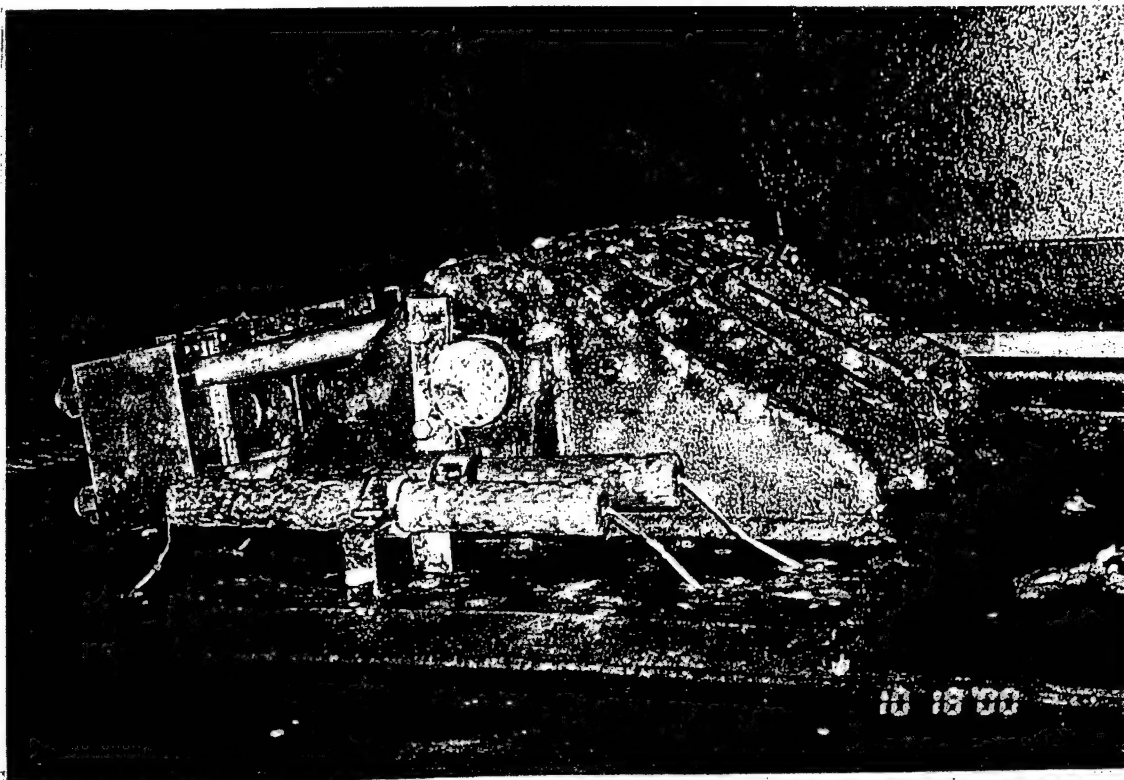


Little  
Goose  
Dam

10/18/00

6-30

**Gate 6**  
Close-up, embedded bottom seal in spillway.



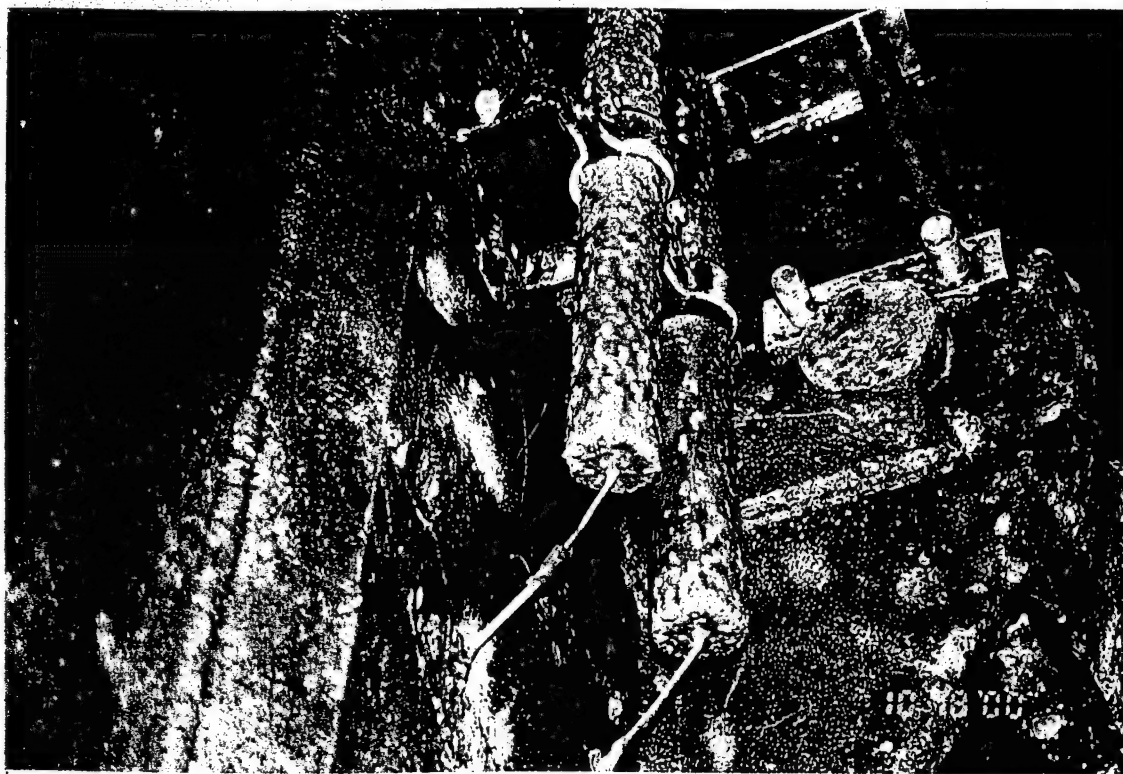
Little  
Goose  
Dam

10/18/00

6-31

Gate 6

Right hoist connection. Light to moderate corrosion on lifting lugs and plates.



Little  
Goose  
Dam

10/18/00

6-32

Gate 6

Right hoist connection. Light to moderate corrosion on lifting lugs and plates. Note: Generally good condition of anodes.



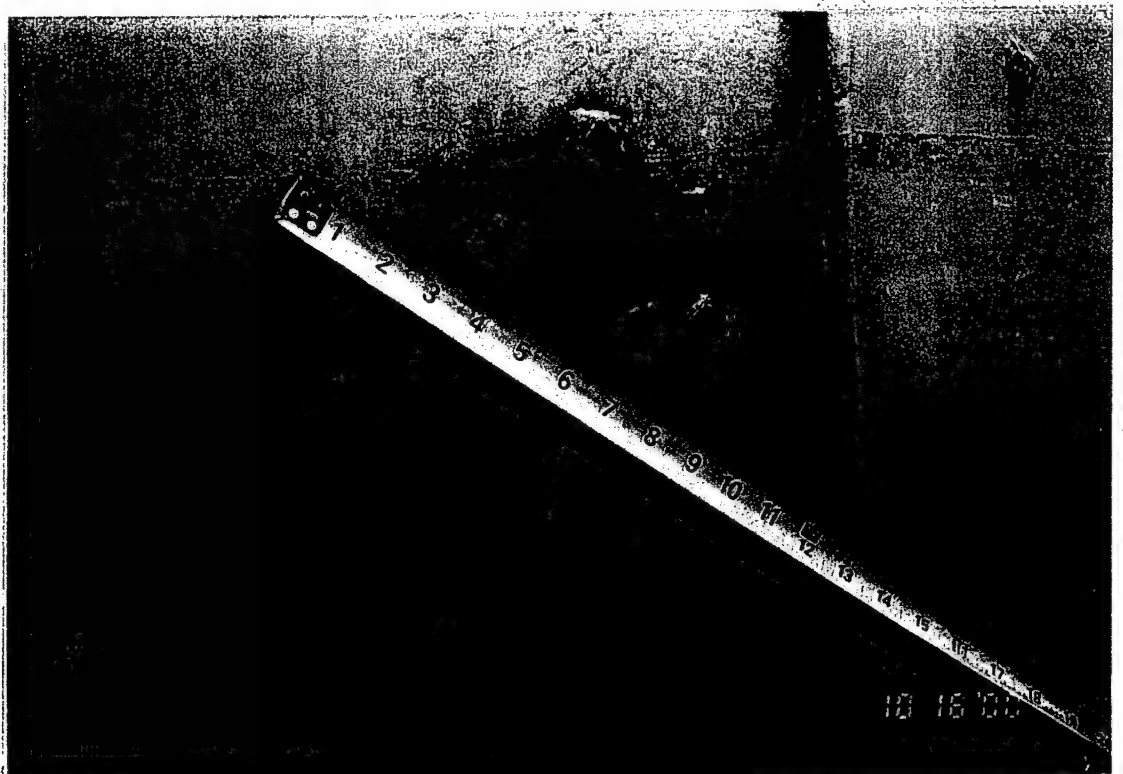


Little  
Goose  
Dam

10/18/00

6-33

Gate 6  
Apparent previous anode bracket.



Little  
Goose  
Dam

10/18/00

6-34

Gate 6  
.Skin plate pitting, typical.



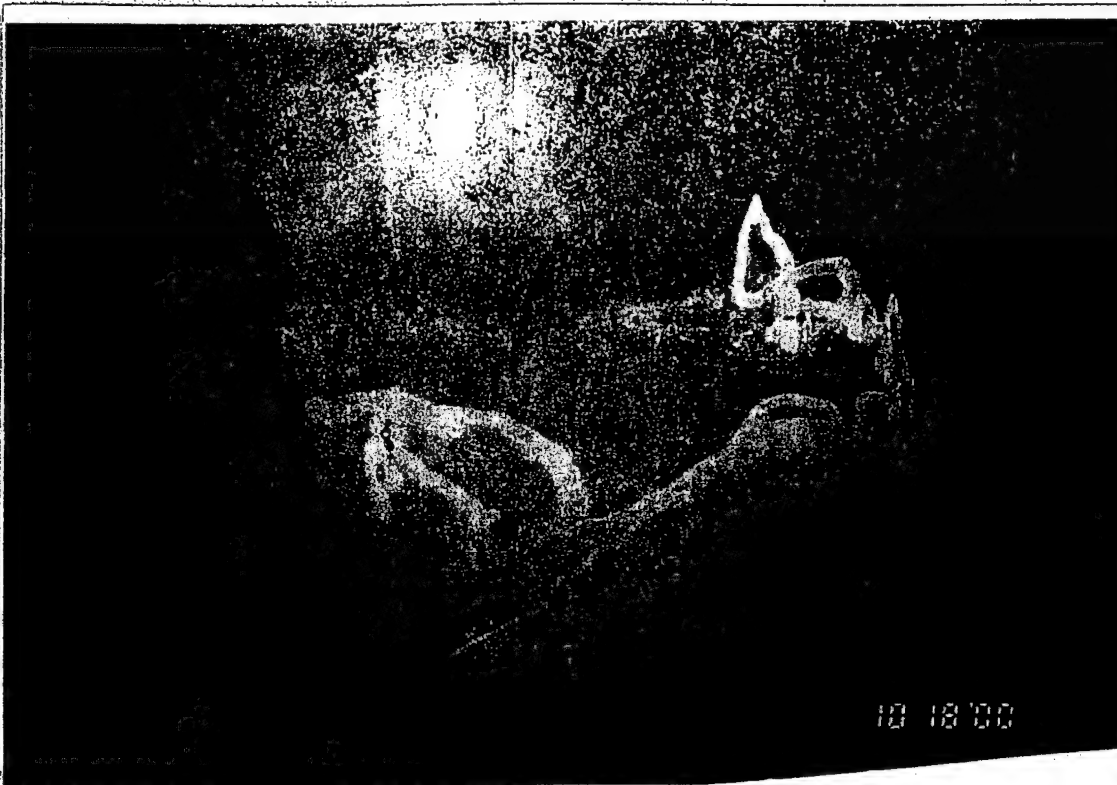
Little  
Goose  
Dam

10/18/00

6-35

Gate 6

Skin plate condition, typical.  
Minimal skin plate pitting.



Little  
Goose  
Dam

10/18/00

6-36

Gate 6

Skin plate condition, typical.  
Minimal skin plate pitting.





Little  
Goose  
Dam

Gate 6  
Left wear plate. Delaminated vinyl  
coating.

10/18/00

6-37

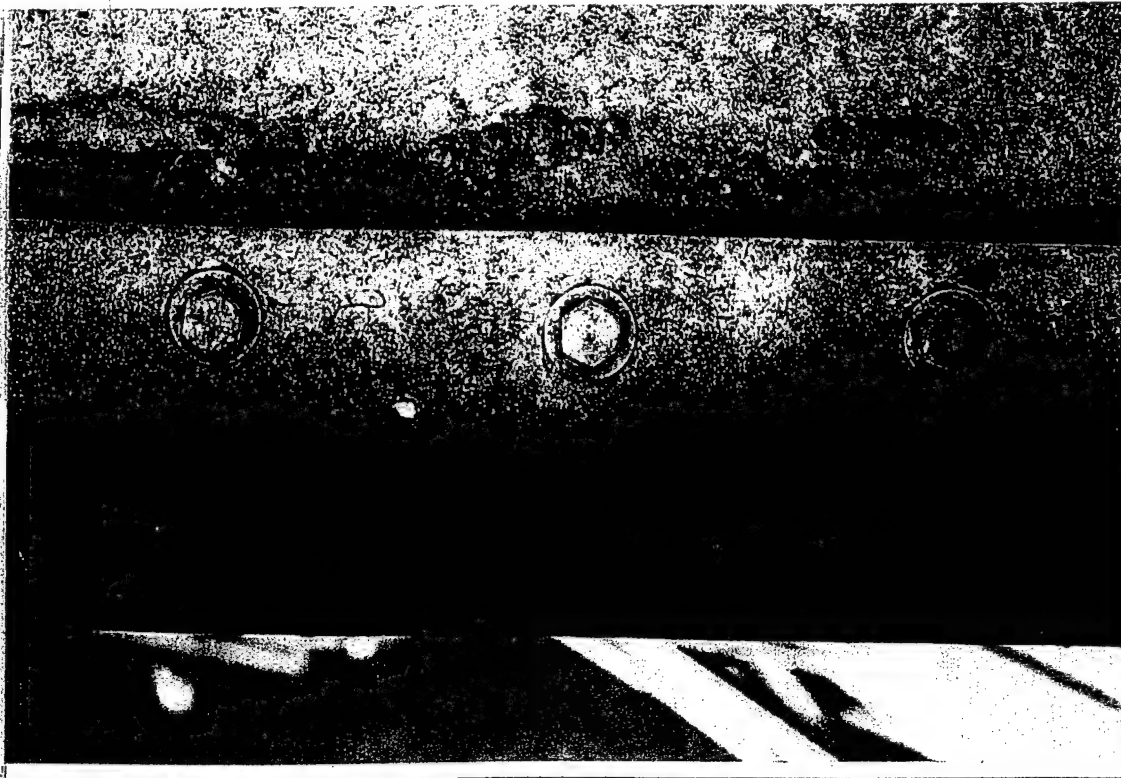


Little  
Goose  
Dam

Gate 6  
Left wear plate. Delaminated vinyl  
coating.

10/18/00

6-38

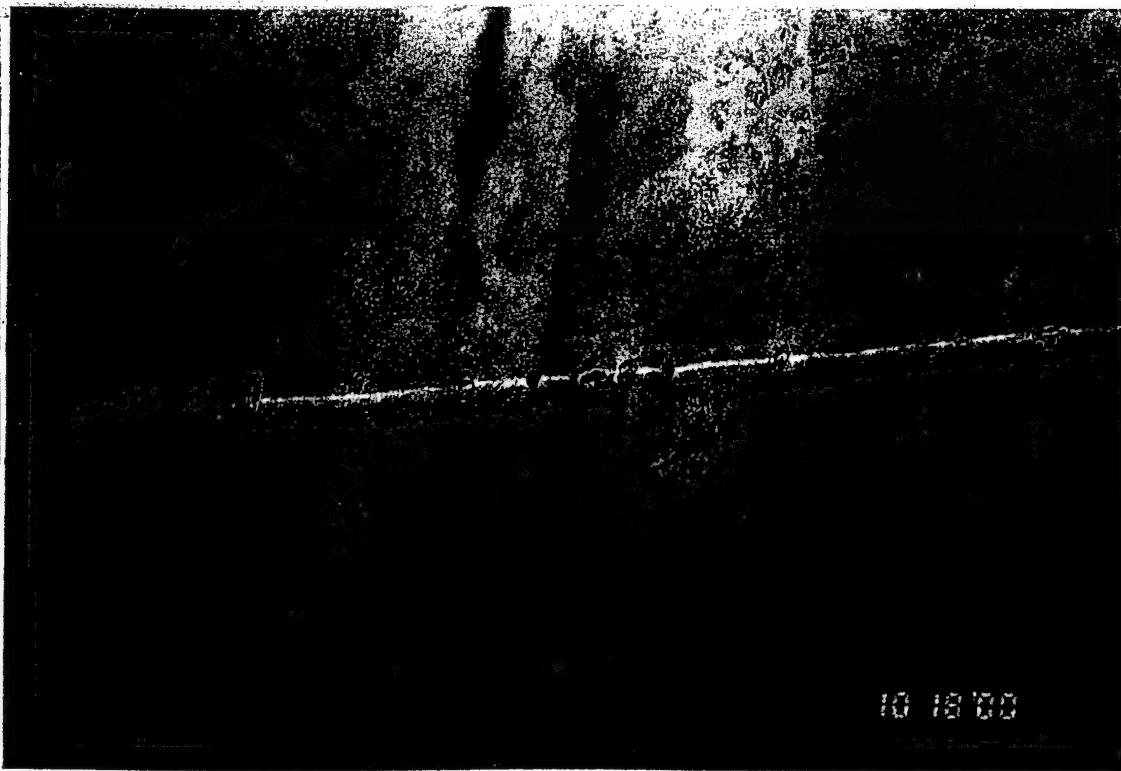


Little  
Goose  
Dam

10/18/00

6-39

Gate 6  
Upstream side of side seal, typical.



Little  
Goose  
Dam

10/18/00

6-40

Gate 6  
Light pitting along skin plate weld,  
typical.



Little  
Goose  
Dam

10/11/00

7-1

**Gate 7**  
Right frame, brace F. Loose moderate  
corrosion on brace.

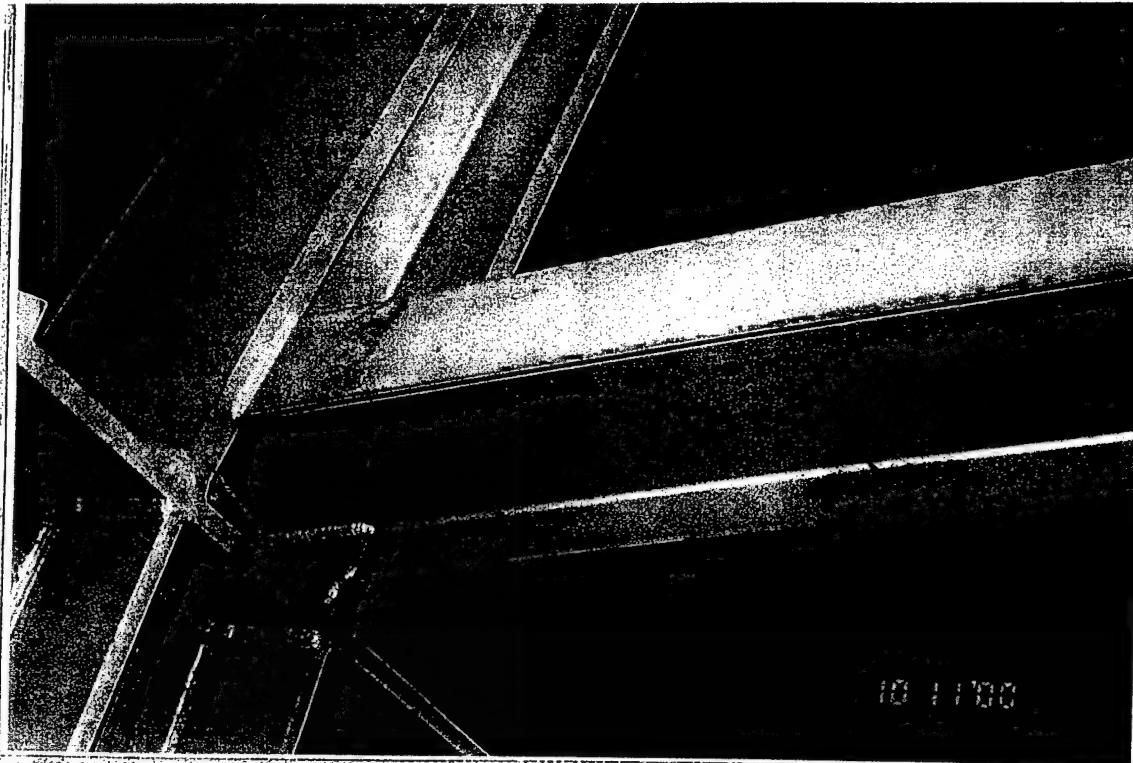


Little  
Goose  
Dam

10/11/00

7-2

**Gate 7**  
Bottom horizontal girder, right end.  
Standing water, no drainage between  
multiple stiffeners, typical.



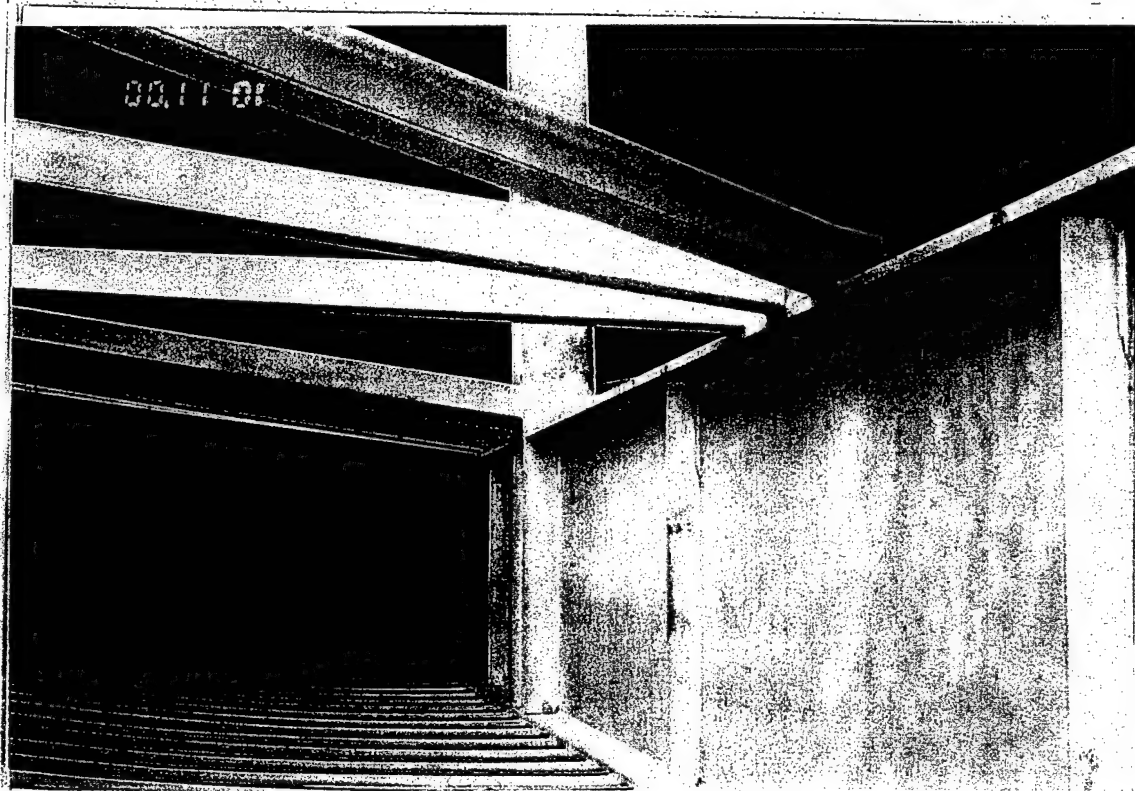
Little  
Goose  
Dam

10/11/00

7-3

**Gate 7**

Left frame, Brace A. Light corrosion  
on brace, radial strut and horizontal  
girder.



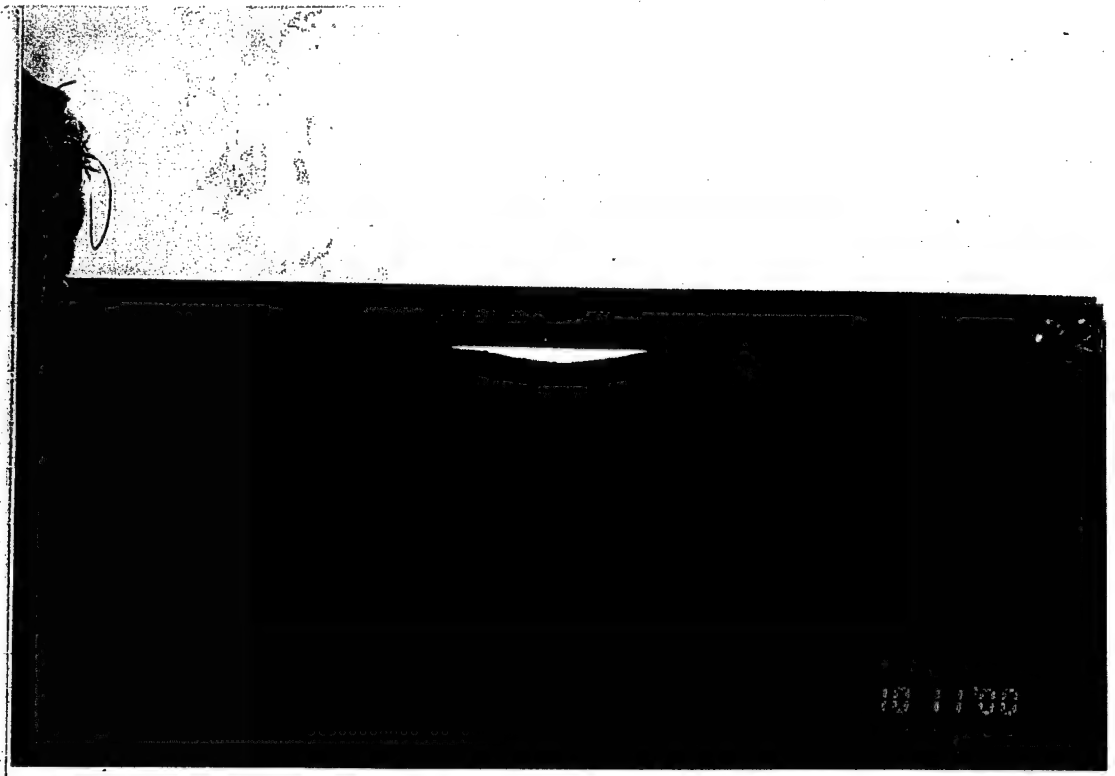
Little  
Goose  
Dam

10/11/00

7-4

**Gate 7**

Middle horizontal girder, typical.

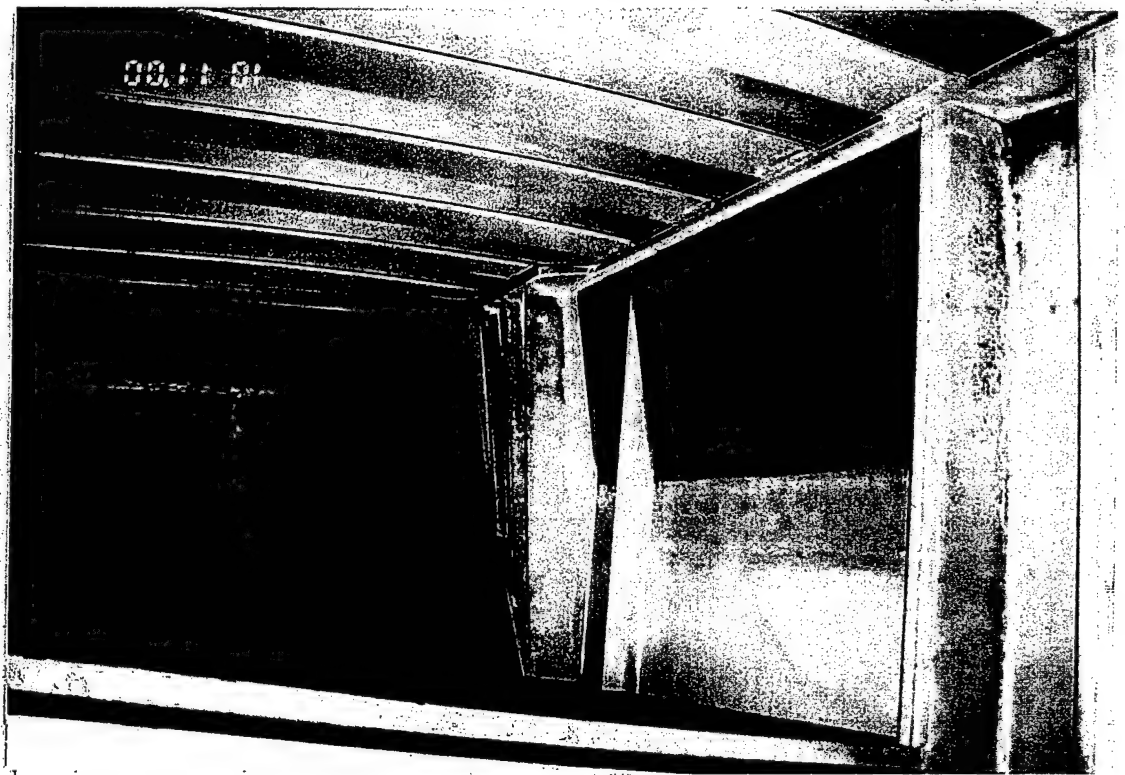


Little  
Goose  
Dam

10/11/00

7-5

Gate 7  
Right frame, Brace L. Small  
deformation in brace flange.



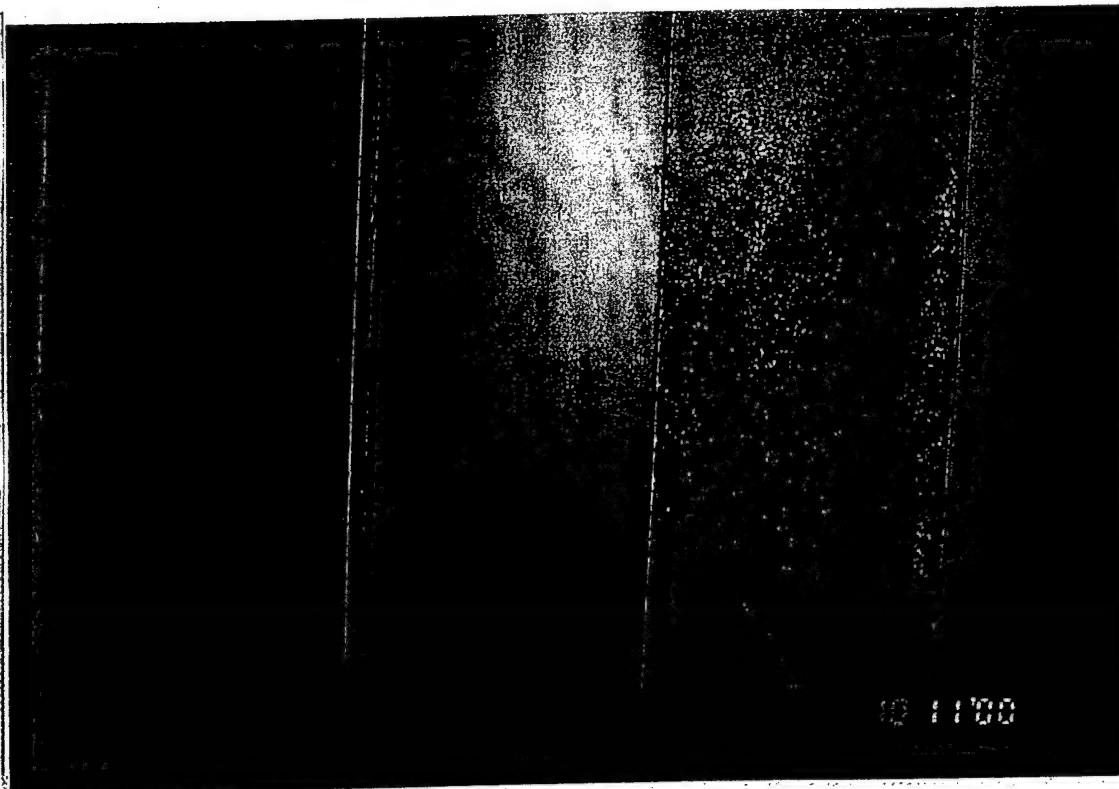
Little  
Goose  
Dam

10/11/00

7-6

Gate 7  
Bottom horizontal girder, right end.  
Standing water on girder web due to  
inadequate drainage and side seal  
leak.





Little  
Goose  
Dam

Gate 7  
Skin plate purlins, typical.

10/11/00

7-7

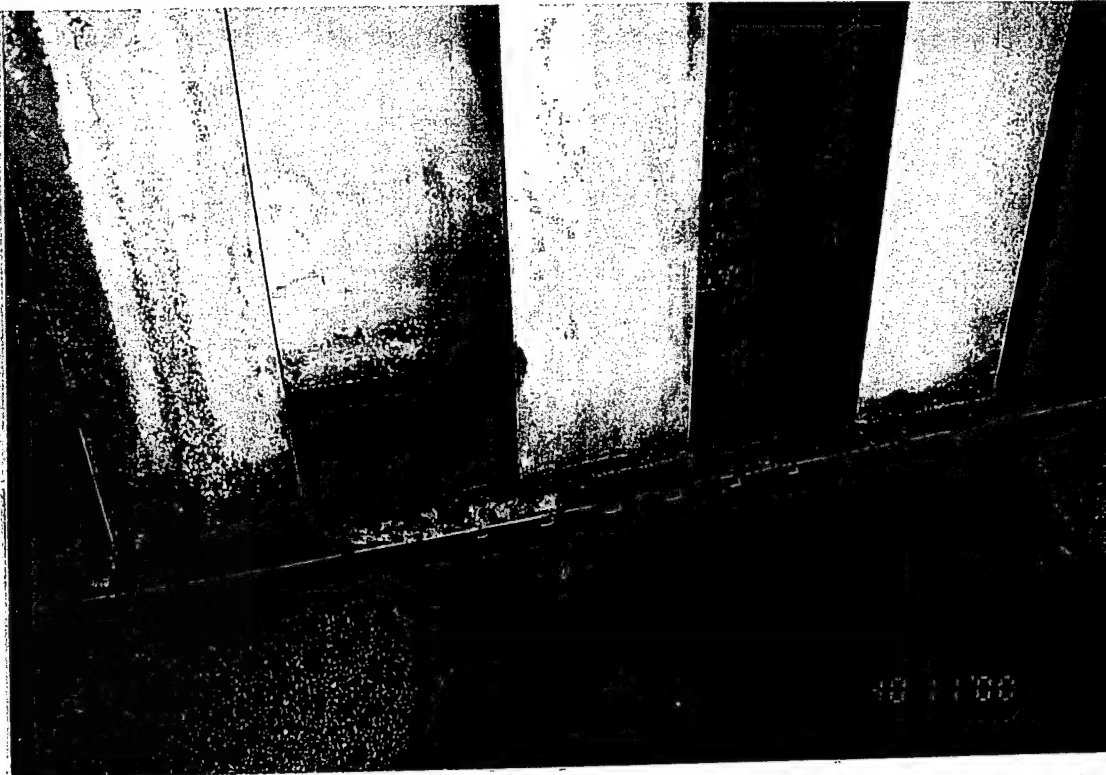


Little  
Goose  
Dam

Gate 7  
Bottom right corner of gate, side seal  
leak.

10/11/00

7-8



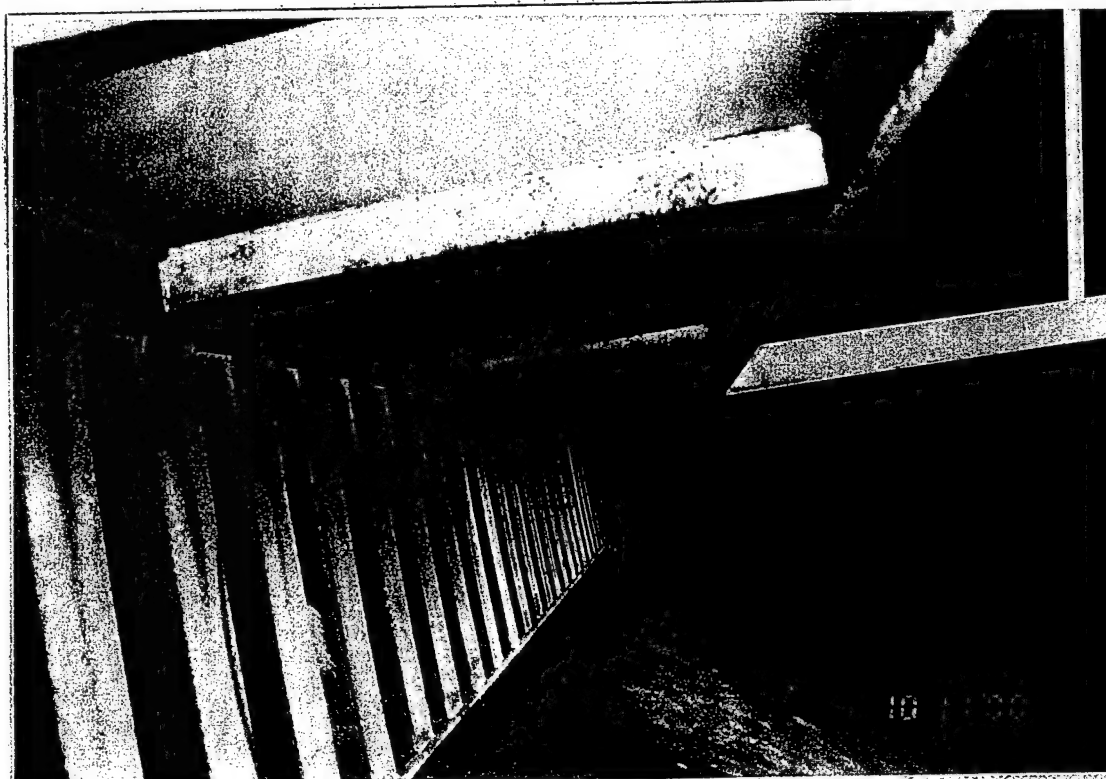
Little  
Goose  
Dam

10/11/00

7-9

#### Gate 7

Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.



Little  
Goose  
Dam

10/11/00

7-10

#### Gate 7

Bottom of bottom horizontal girder, typical.





Little  
Goose  
Dam

10/11/00

7-11

#### Gate 7

Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate, typical.



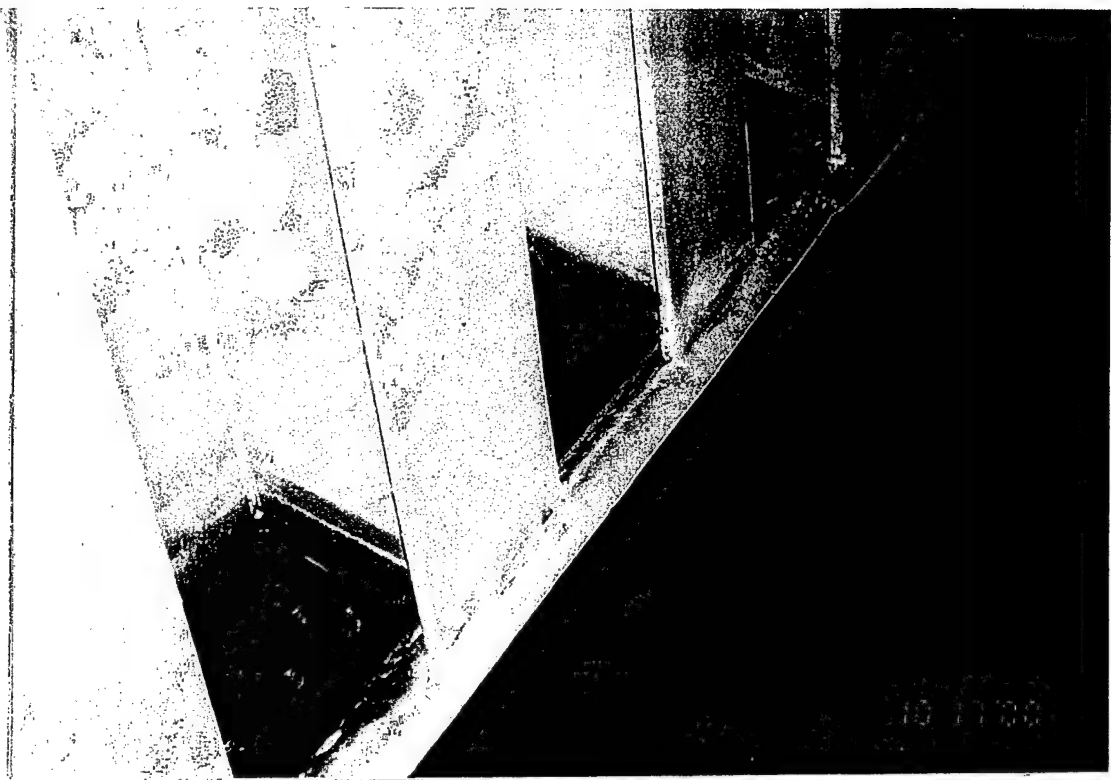
Little  
Goose  
Dam

10/11/00

7-12

#### Gate 7

Bottom horizontal girder, left end.  
Standing water, no drainage between  
multiple stiffeners, typical.



Little  
Goose  
Dam

10/17/00

7-13

**Gate 7**  
Bottom seal closure plate. Standing  
water between closure plate, purlin  
webs and skinplate, typical.

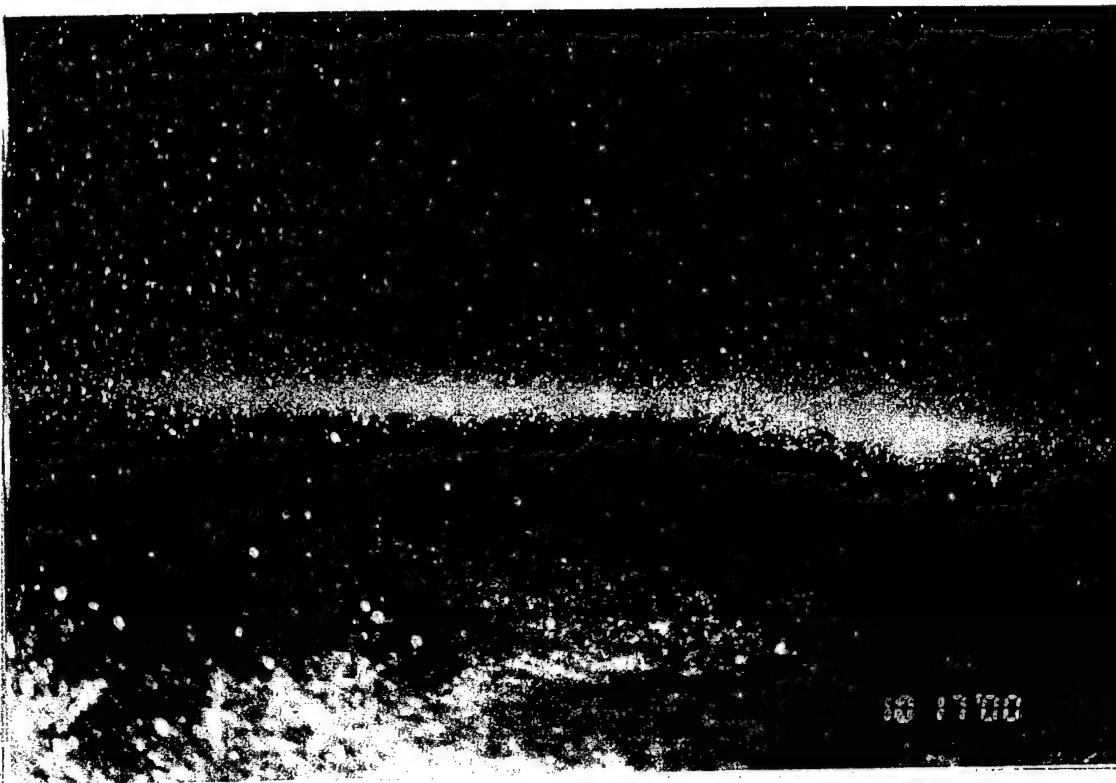


Little  
Goose  
Dam

10/17/00

7-14

**Gate 7**  
Bottom seal closure plate. Standing  
water between closure plate, purlin  
webs and skinplate, typical.

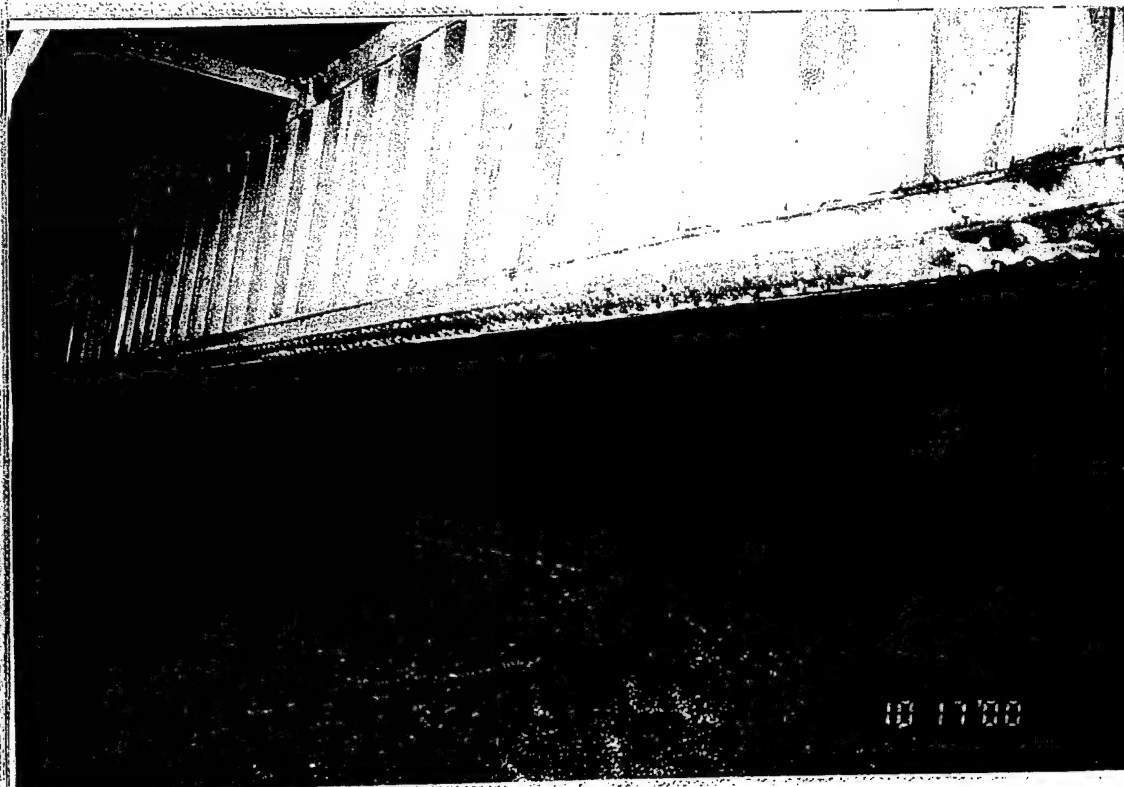


Little  
Goose  
Dam

10/17/00

7-15

Gate 7  
Stop log leakage precluding  
inspection of hoist connections from  
bottom.

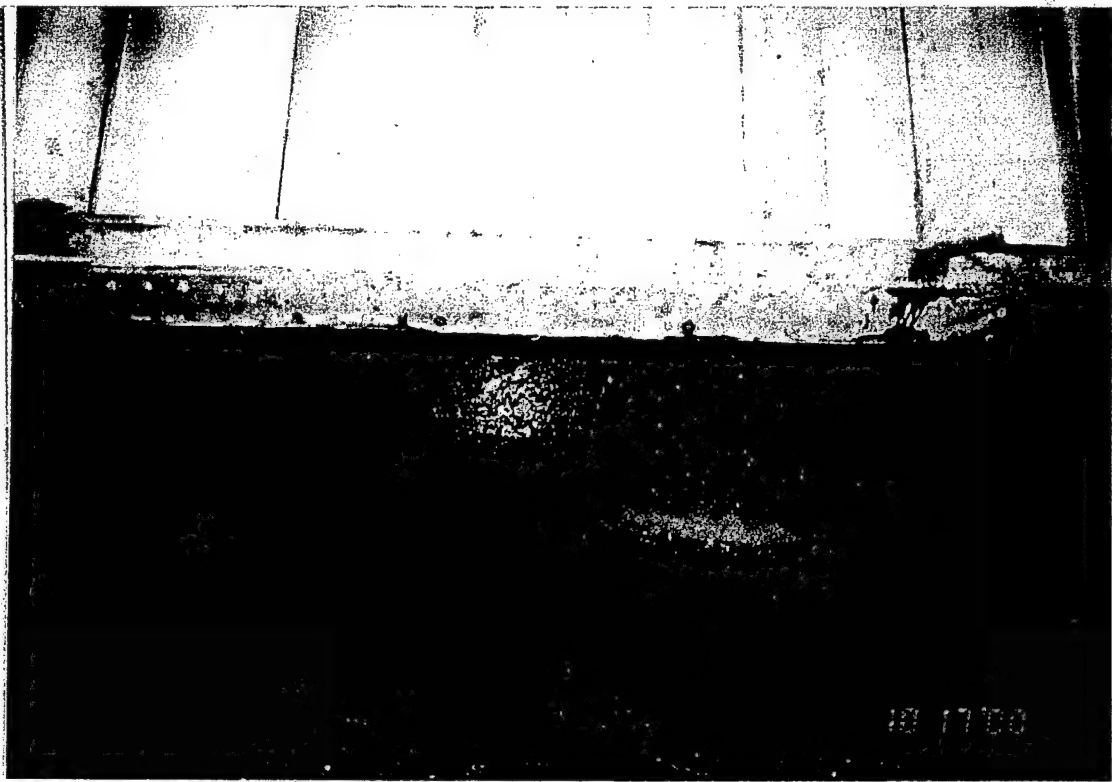


Little  
Goose  
Dam

10/17/00

7-16

Gate 7  
Bottom of gate and bottom seal  
keeper plate, typical. Stop log  
leakage precluding inspection of  
hoist connections from bottom.



Little  
Goose  
Dam

10/17/00

7-17

Gate 7  
Bottom seal keeper plate, typical.  
Stop log leakage precluding  
inspection of hoist connections from  
bottom.

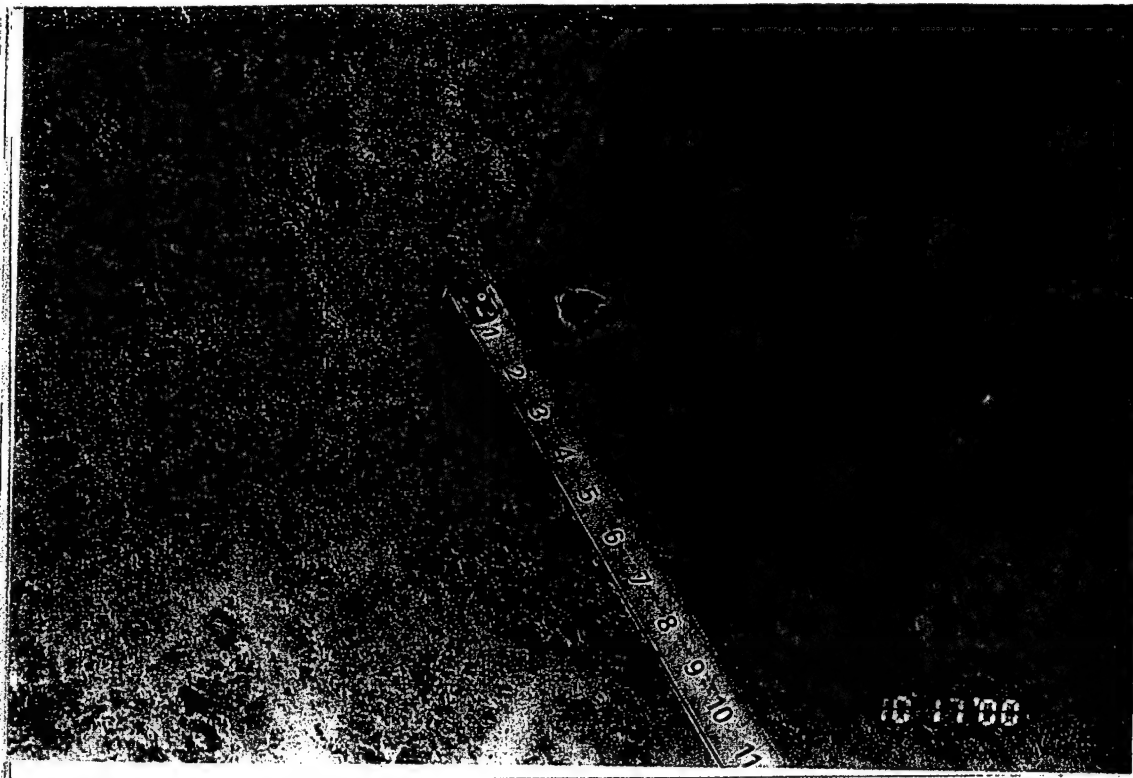


Little  
Goose  
Dam

10/17/00

7-18

Gate 7  
Skin plate condition, typical.

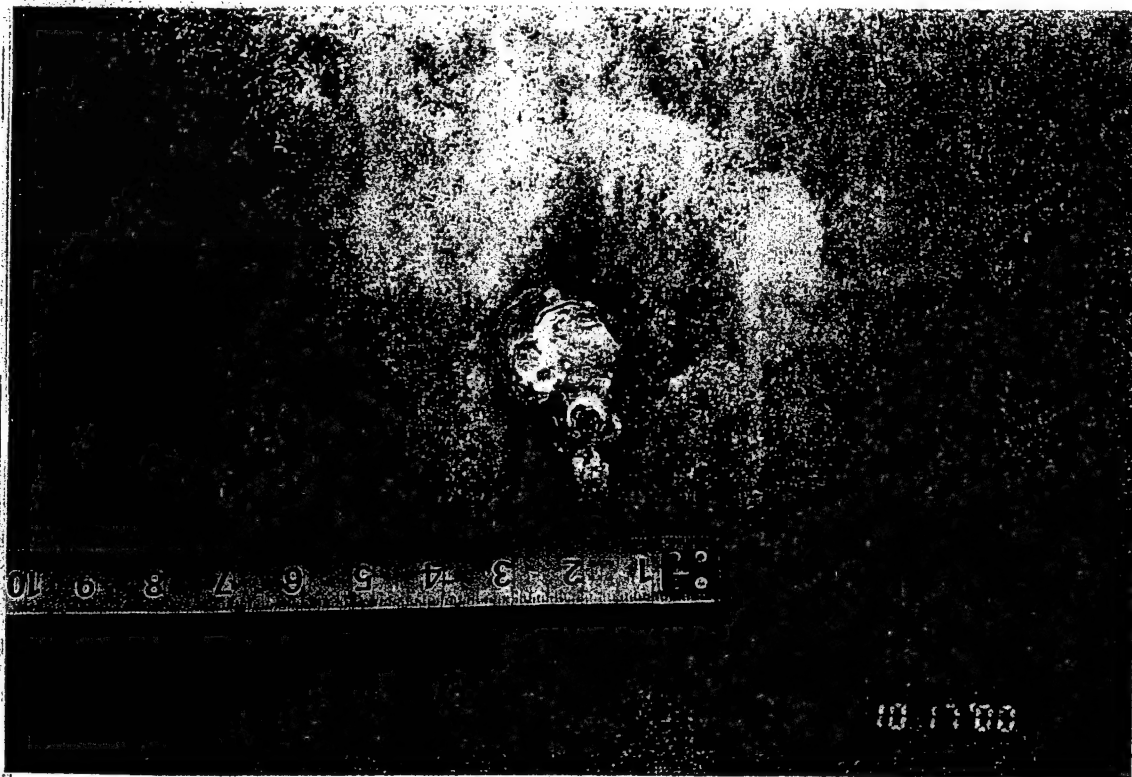


Little  
Goose  
Dam

Gate 7  
Skin plate pitting, typical.

10/17/00

7-19

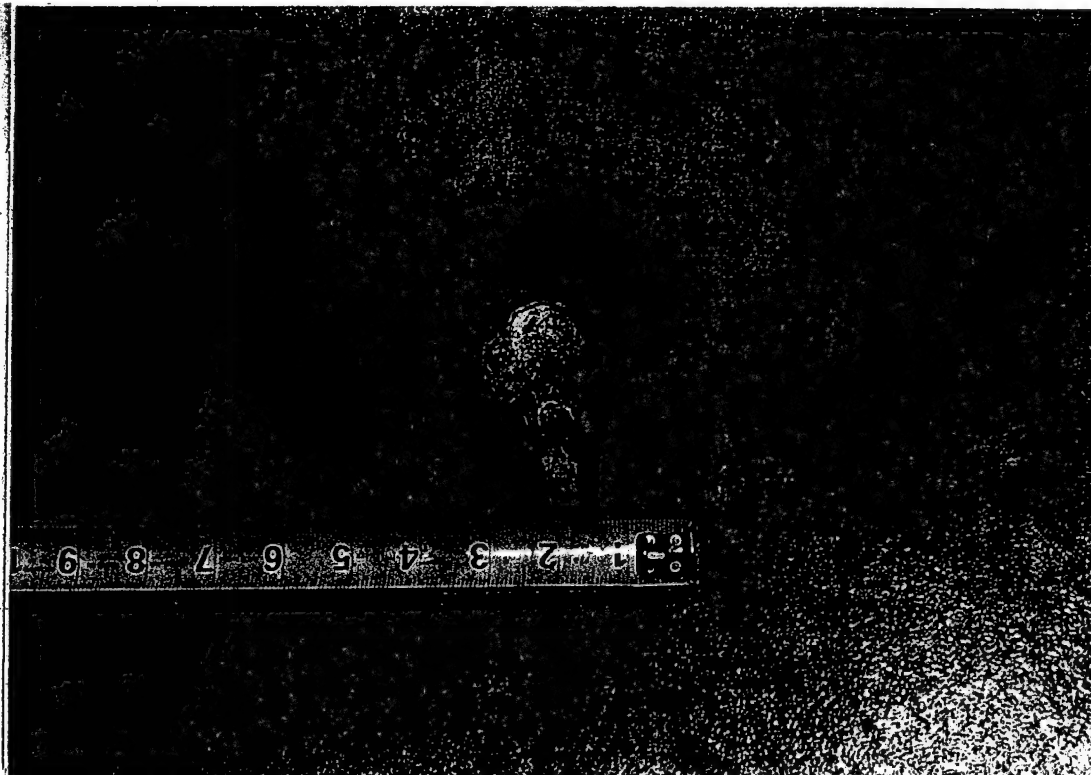


Little  
Goose  
Dam

Gate 7  
Skin plate pitting, typical.

10/17/00

7-20



Little  
Goose  
Dam

Gate 7  
Skin plate pitting, typical.

10/17/00

7-21



Little  
Goose  
Dam

Gate 7  
Skin plate pitting, typical.

10/17/00

7-22





Little  
Goose  
Dam

Gate 7  
Upstream side of side seal, typical.

10/17/00

7-23



Little  
Goose  
Dam

Gate 7  
Wear plate condition, typical.

10/17/00

7-24





Little  
Goose  
Dam

Gate 7  
Waterblasting skin plate.

10/17/00

7-25

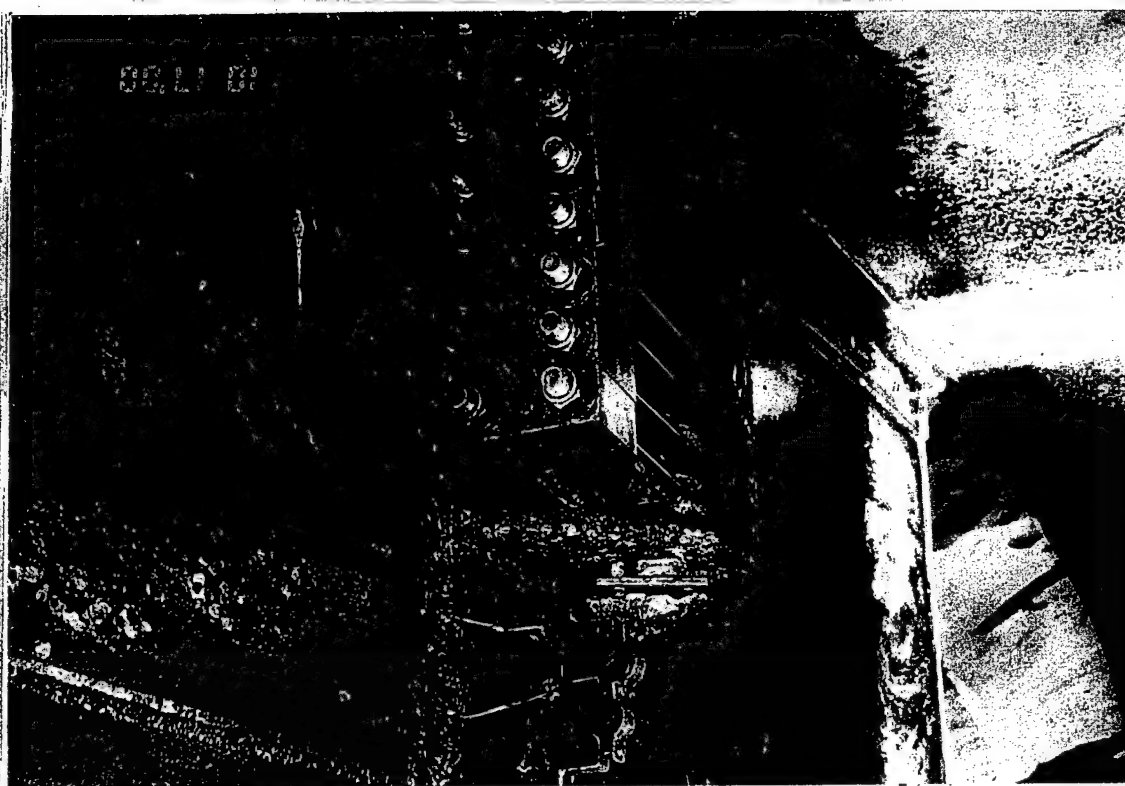


Little  
Goose  
Dam

Gate 7  
Hoist connection, from above.

10/17/00

7-26



Little  
Goose  
Dam

10/17/00

7-27

**Gate 7**

Hoist connection from above. Light to moderate corrosion on lifting lugs and plates. Stainless steel U-bolts and socket blocks in good condition.



Little  
Goose  
Dam

Gate 8  
Left frame Brace C. Light corrosion  
on brace, typical.

10/10/00

8-1

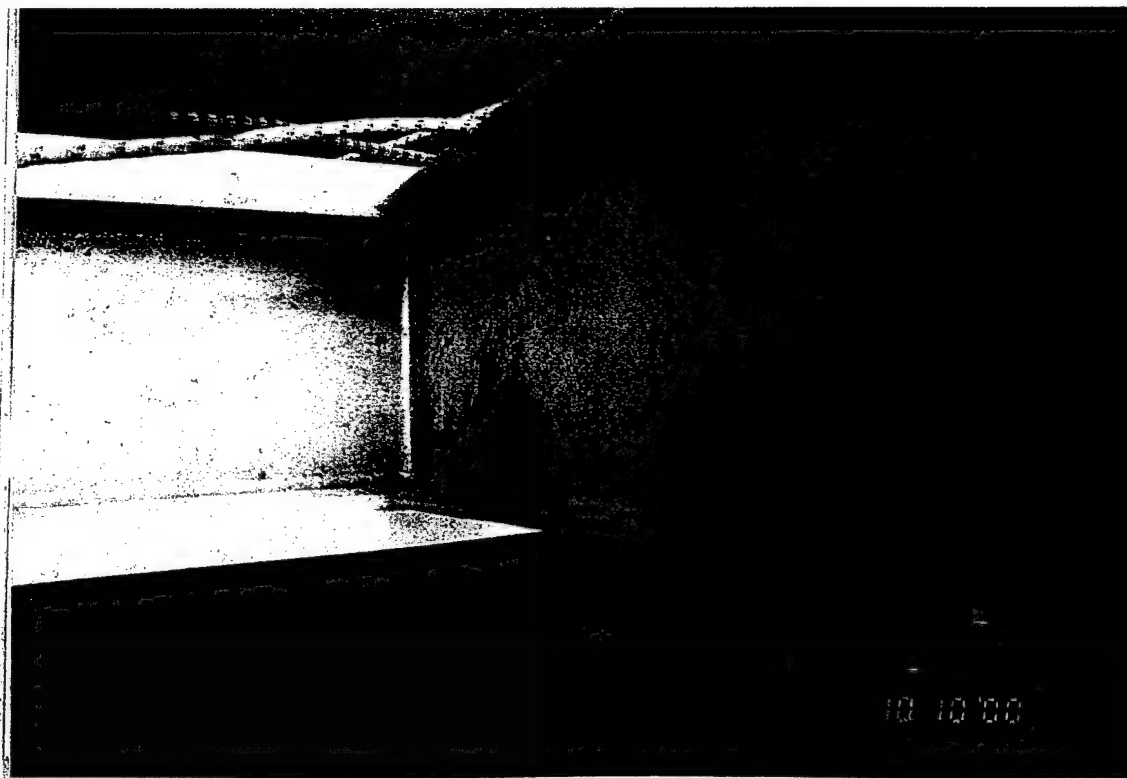


Little  
Goose  
Dam

Gate 8  
Close-up, left frame Brace D. Light  
corrosion on brace, typical.

10/10/00

8-2



Little  
Goose  
Dam

10/10/00

8-3

Gate 8

Left frame Brace G. Light corrosion  
on brace, typical.



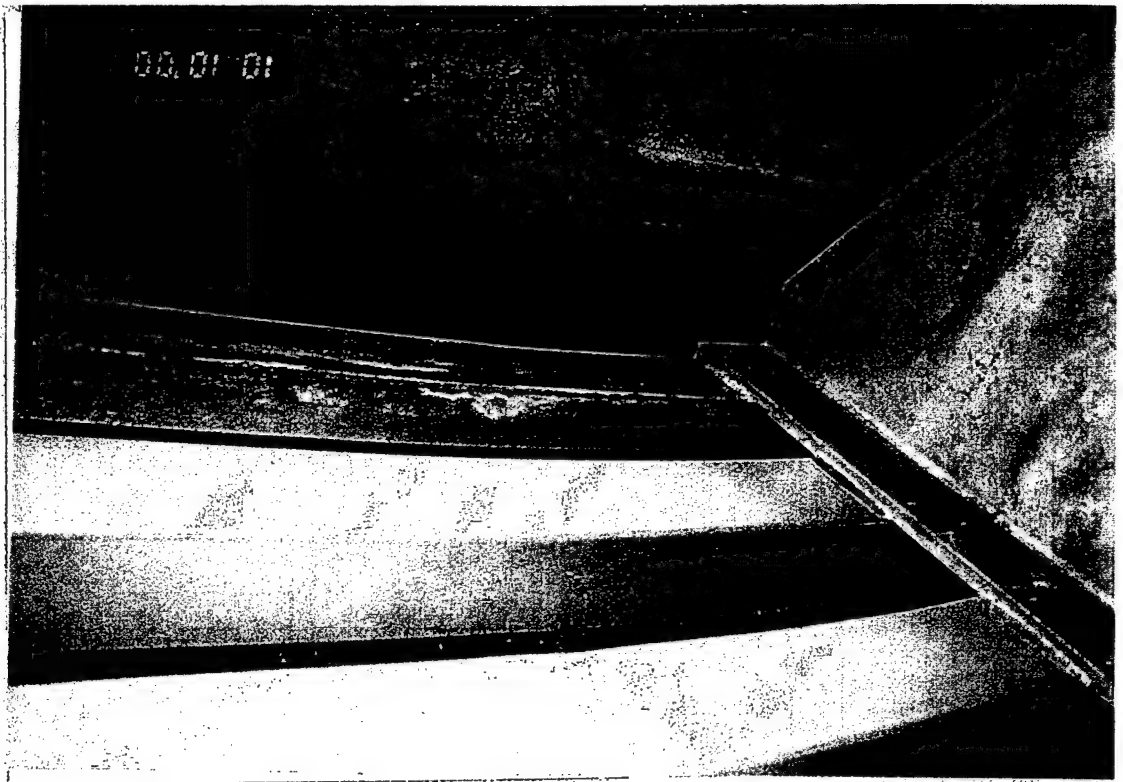
Little  
Goose  
Dam

10/10/00

8-4

Gate 8

Outside of left frame, typical.

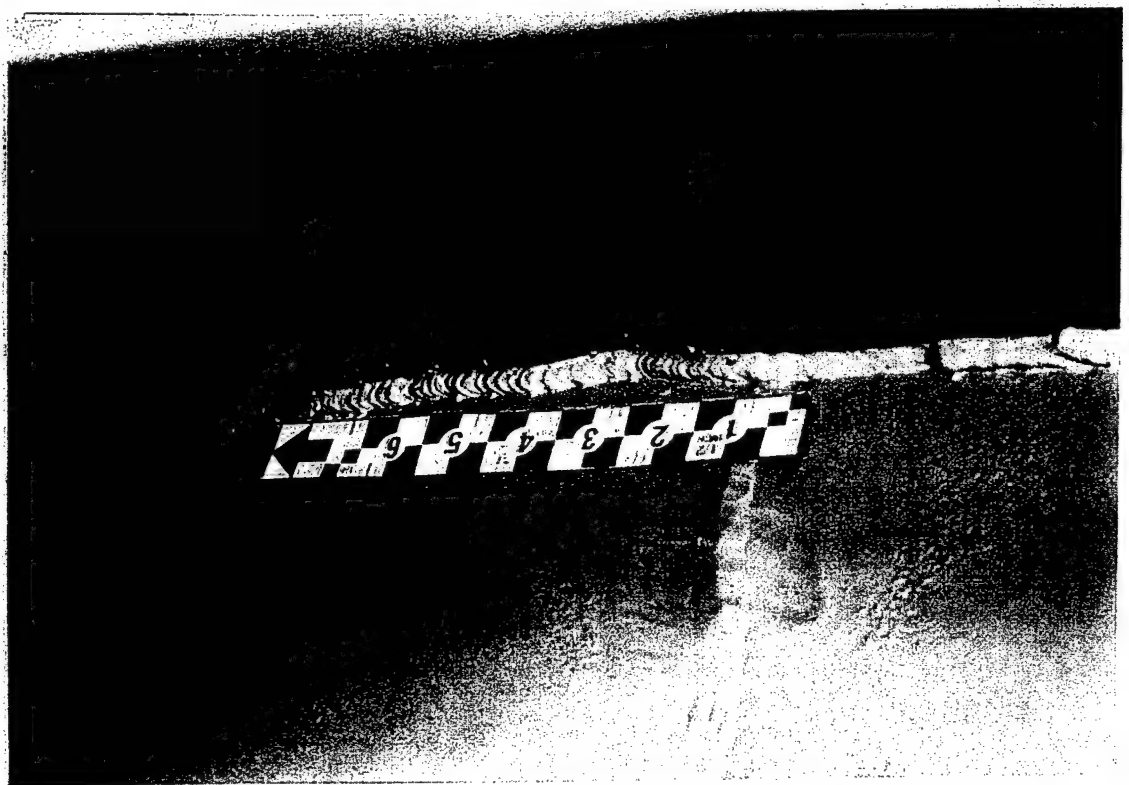


Little  
Goose  
Dam

**Gate 8**  
Left end, middle horizontal girder.  
Light corrosion on girder, purlins.

10/10/00

8-5

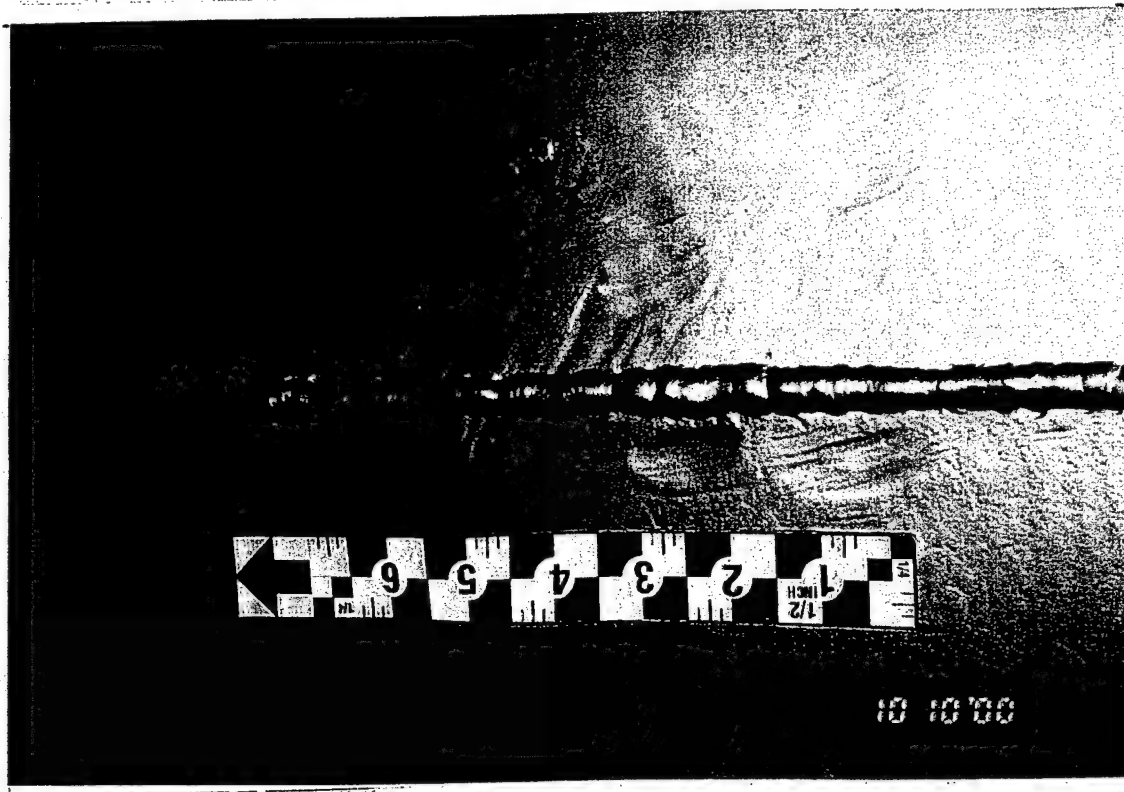


Little  
Goose  
Dam

**Gate 8**  
Downstream surface of skin plate, left  
side of gate above middle horizontal  
girder. Apparent grind marks from  
weld repair.

10/10/00

8-6



Little  
Goose  
Dam

10/10/00

8-7

Gate 8  
Downstream surface of skin plate, left  
side of gate above middle horizontal  
girder. Apparent grind marks from  
weld repair.

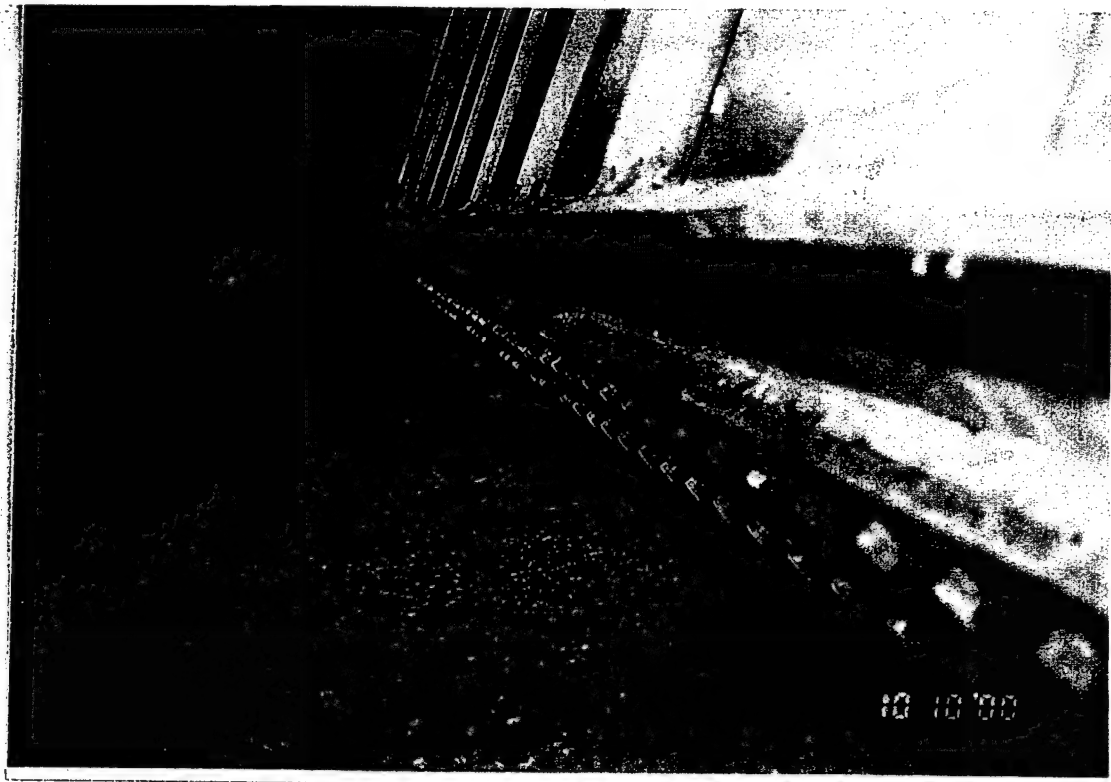


Little  
Goose  
Dam

10/10/00

8-8

Gate 8  
Bottom horizontal girder. Standing  
water, no drainage between multiple  
stiffeners, typical. Girder flange to  
skin plate stiffeners, standing water,  
no drainage.



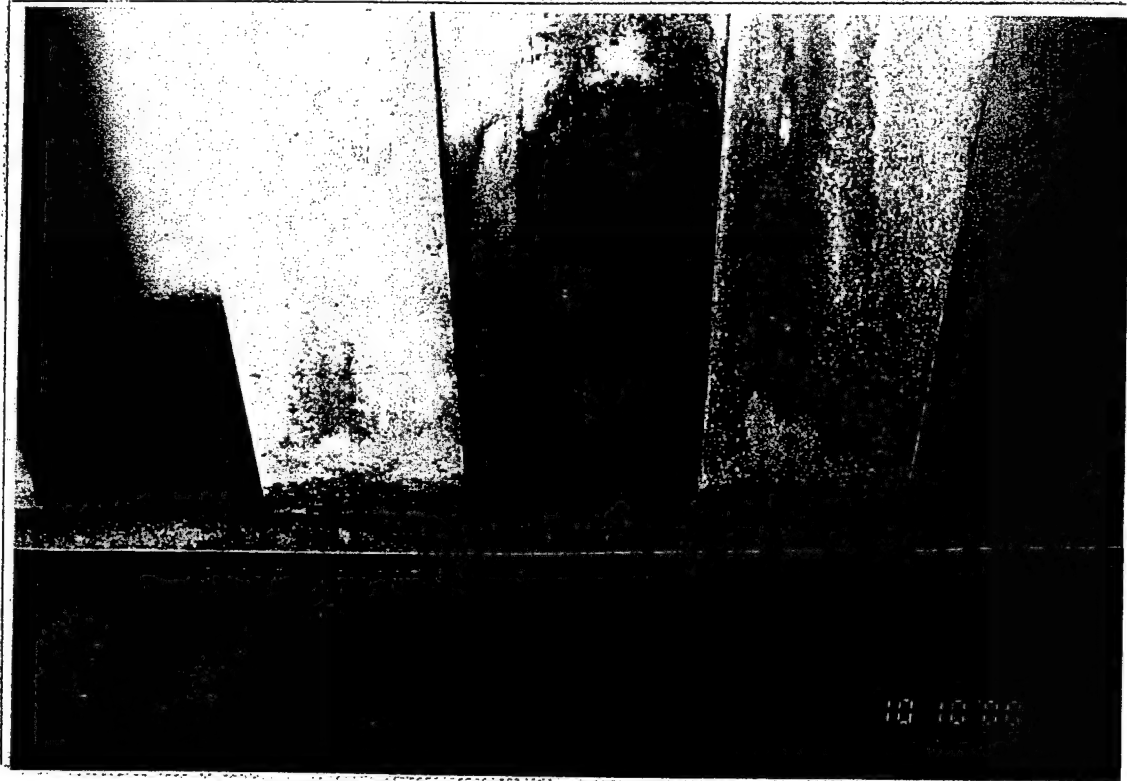
Little  
Goose  
Dam

10/10/00

8-9

#### Gate 8

Bottom seal keeper plate, light corrosion, typical. Leak at center construction joint in spillway monolith.



Little  
Goose  
Dam

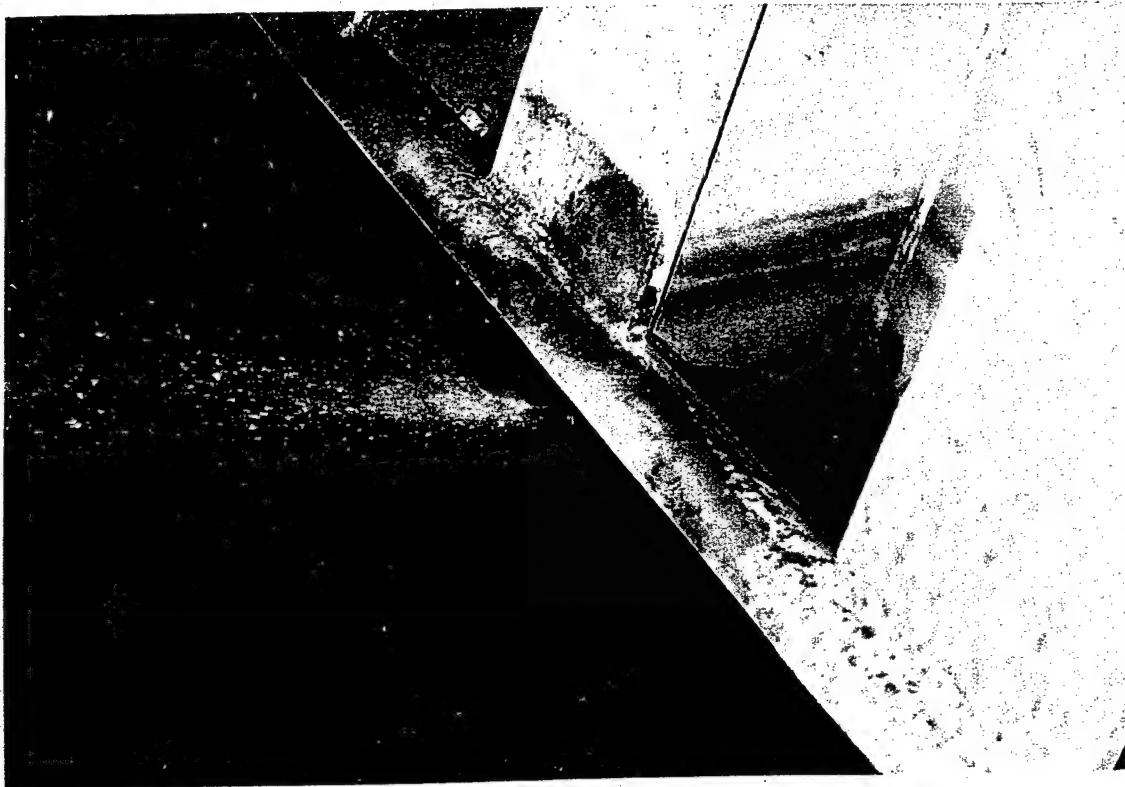
10/10/00

8-10

#### Gate 8

Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate, typical.





Little  
Goose  
Dam

10/10/00

8-11

#### Gate 8

Bottom seal closure plate, standing water between closure plate, purlin webs and skinplate, typical. Leak at center construction joint in spillway monolith.



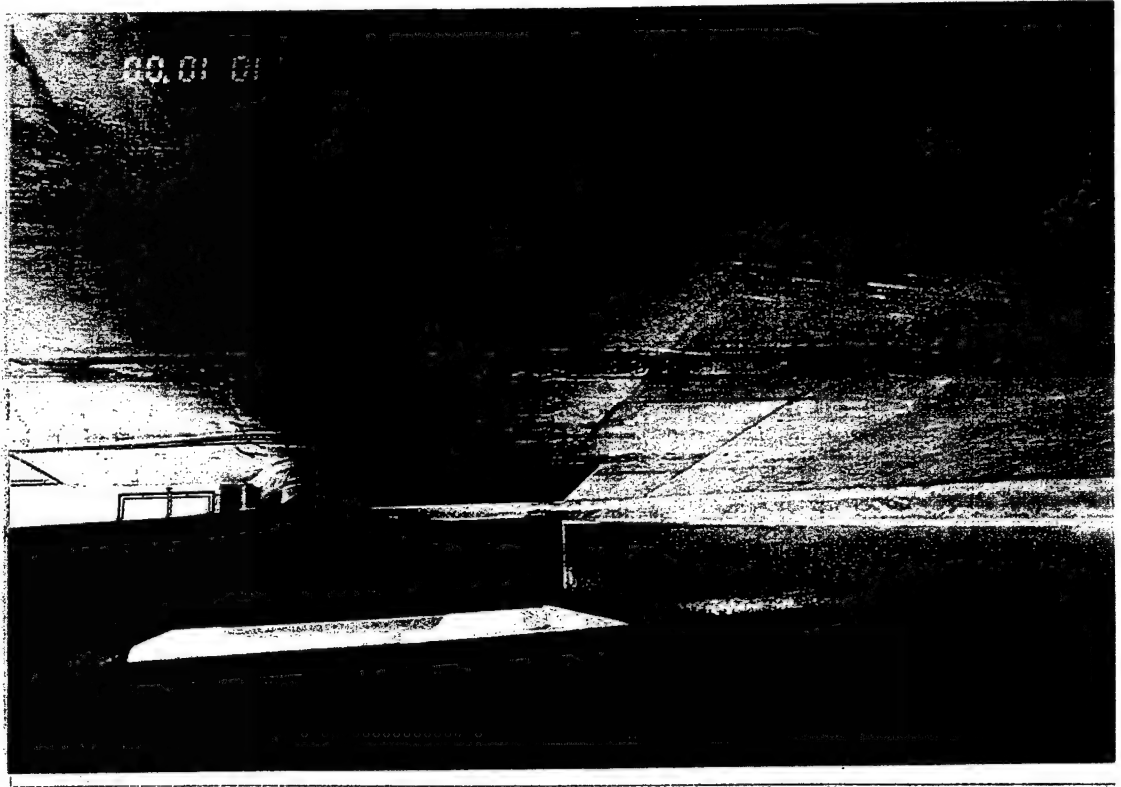
Little  
Goose  
Dam

10/10/00

8-12

#### Gate 8

Side seal leak, bottom left side of gate.

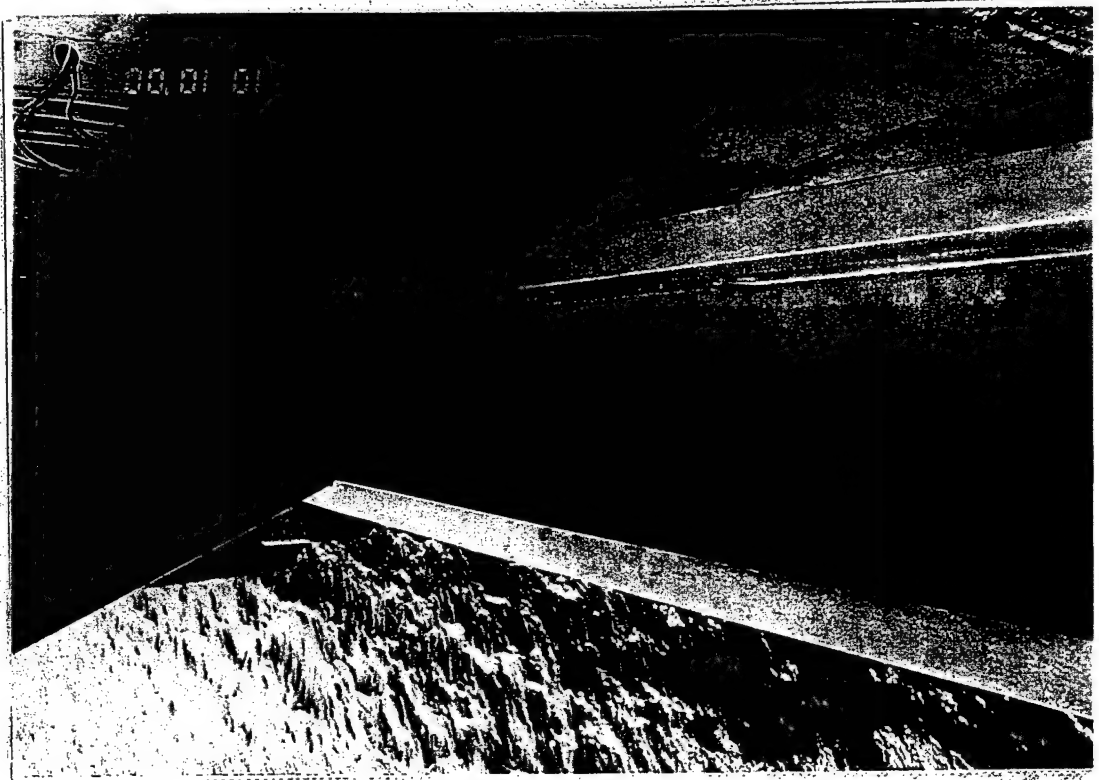


Little  
Goose  
Dam

Gate 8  
Outside of right frame, typical.

10/10/00

8-13



Little  
Goose  
Dam

Gate 8  
Right frame, middle radial strut,  
standing water between girder  
flanges due to drain above (see photo  
8-15).

10/10/00

8-14



Little  
Goose  
Dam

10/10/00

8-15

Gate 8

Drain in right pier wall, draining on  
gate members.



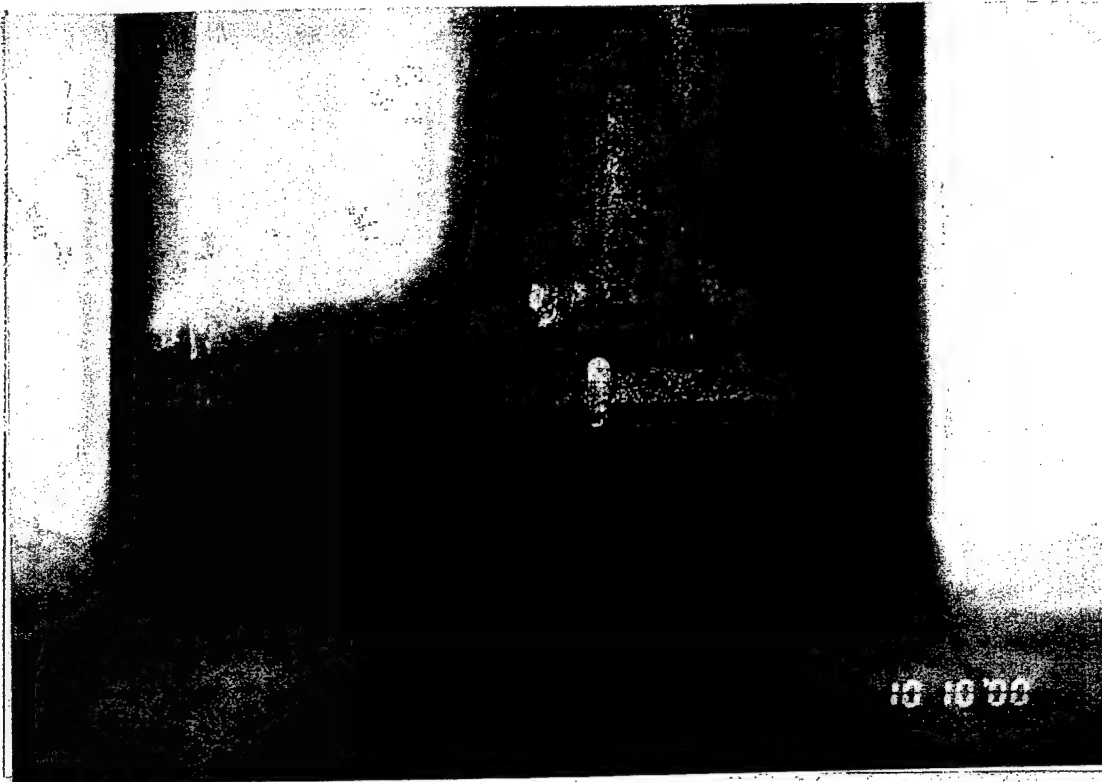
Little  
Goose  
Dam

10/10/00

8-16

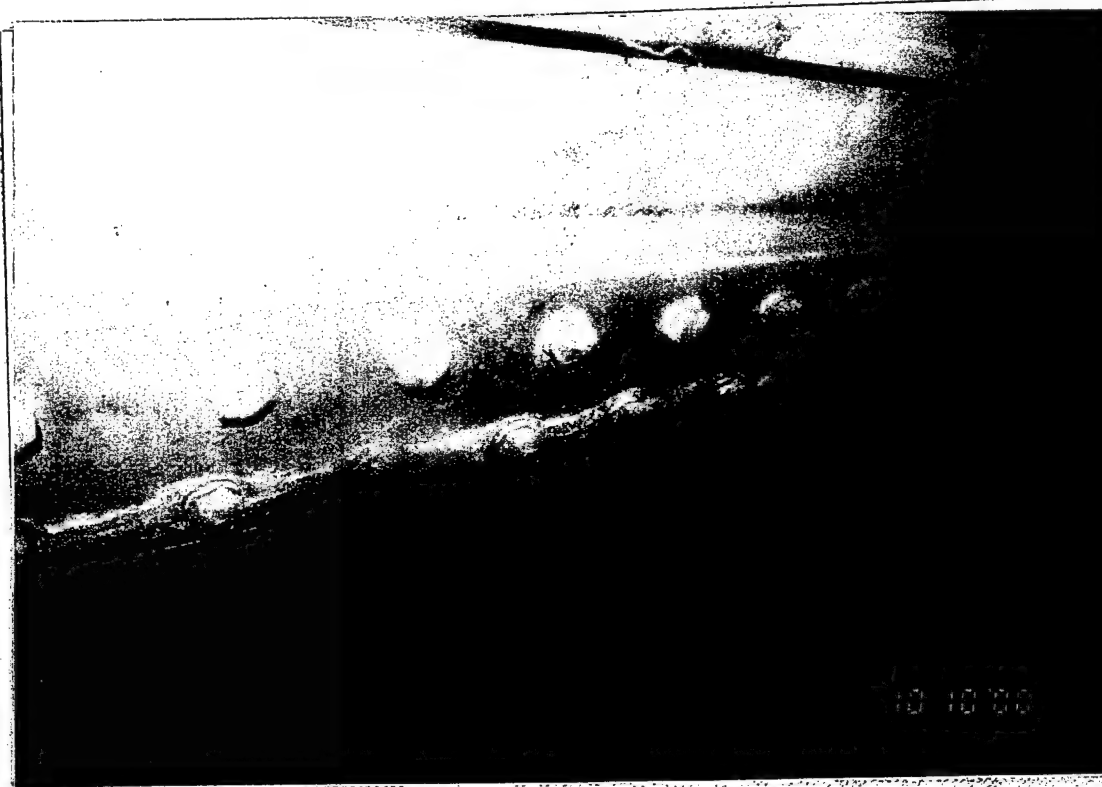
Gate 8

Typical upstream skin plate  
condition, heavy concentration of  
pitting.



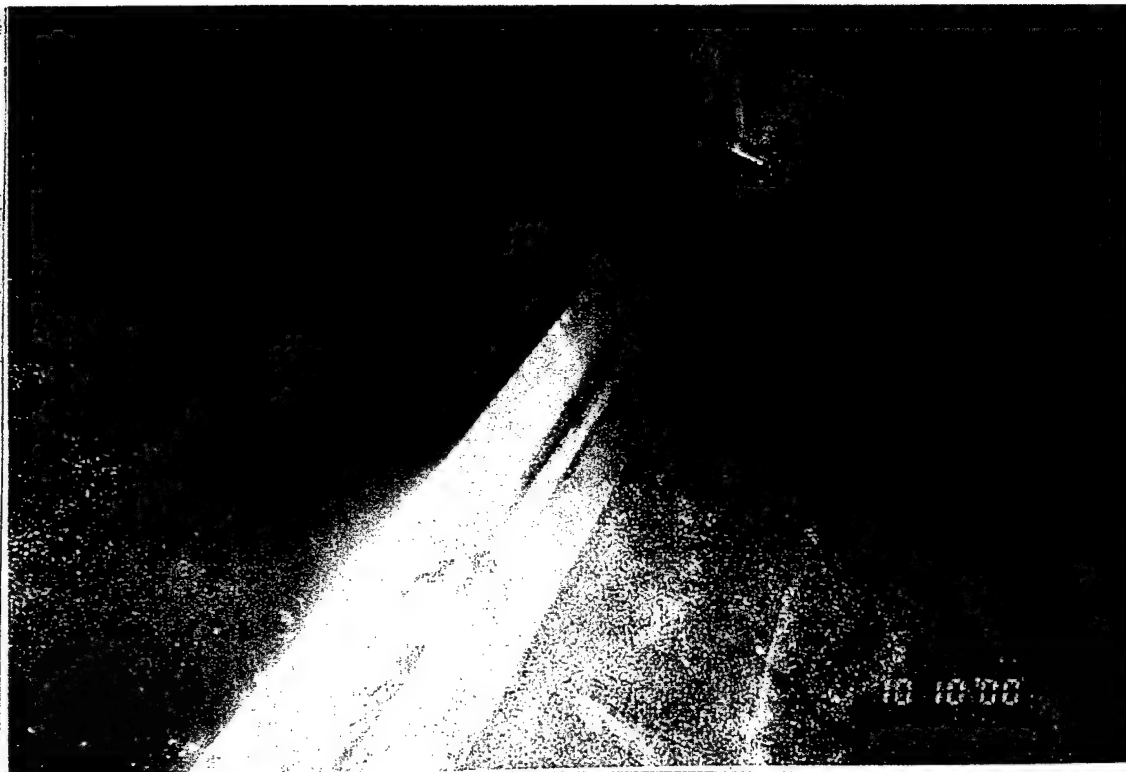
Little  
Goose  
Dam  
10/10/00  
8-17

**Gate 8**  
Bottom seal closure plate looking  
upstream. Standing water between  
closure plate, purlin webs and  
skinplate, typical.



Little  
Goose  
Dam  
10/10/00  
8-18

**Gate 8**  
Bottom seal keeper plate, typical.



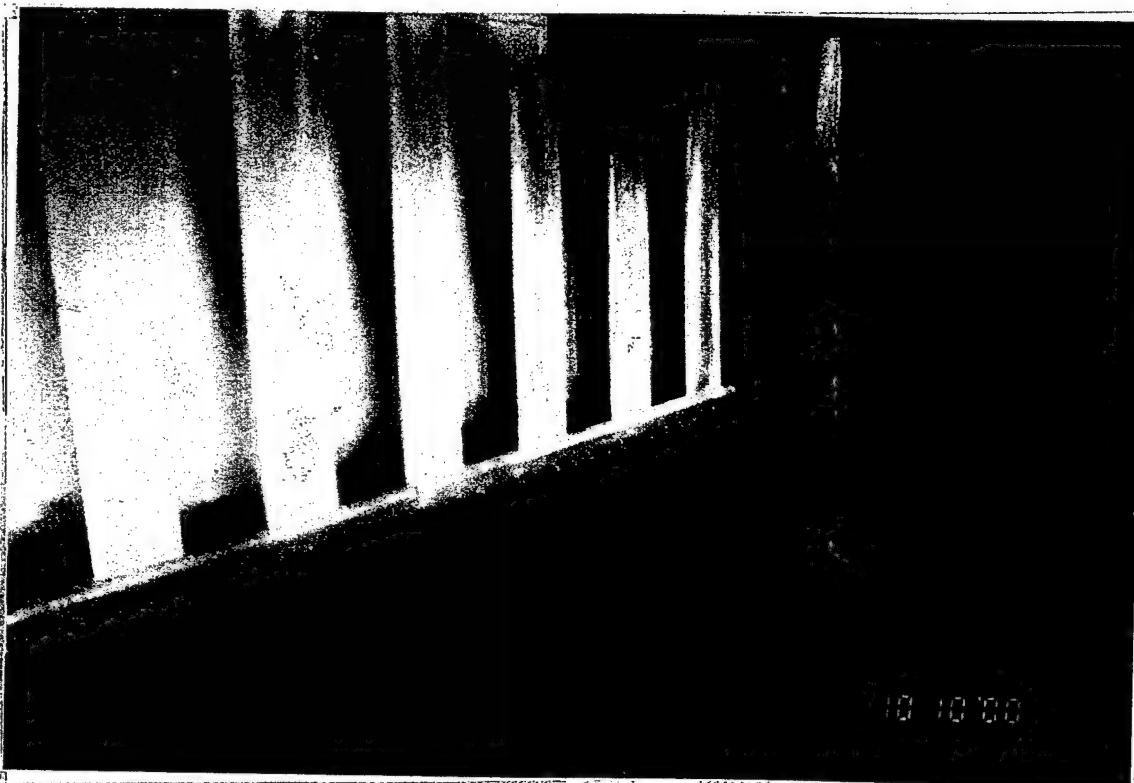
Little  
Goose  
Dam

10/10/00

8-19

#### Gate 8

Embedded bottom seal plate. Note:  
heavy flow due to stop log leakage.



Little  
Goose  
Dam

10/10/00

8-20

#### Gate 8

Bottom left corner of gate. Bottom  
seal closure plate looking upstream.  
Standing water between closure  
plate, purlin webs and skinplate,  
typical.



Little  
Goose  
Dam

Gate 8  
Skin plate pitting, typical.

10/10/00

8-21

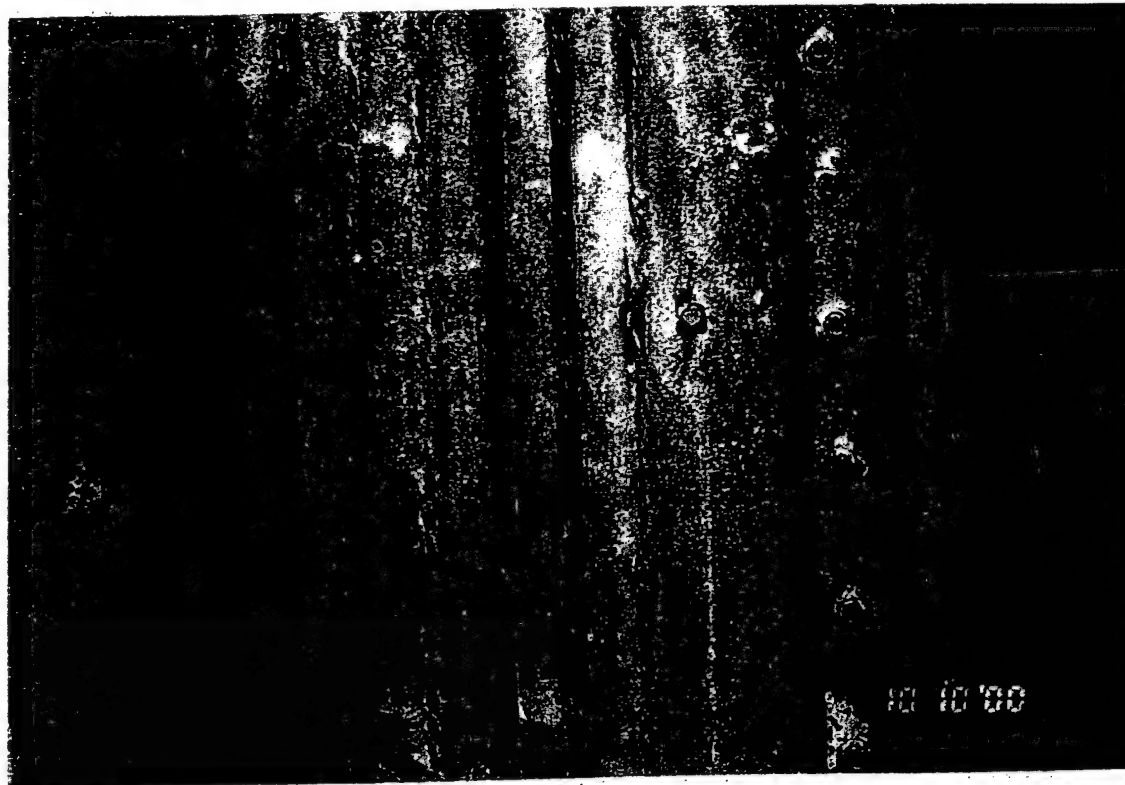


Little  
Goose  
Dam

Gate 8  
Skin plate, typical.

10/10/00

8-22



Little  
Goose  
Dam

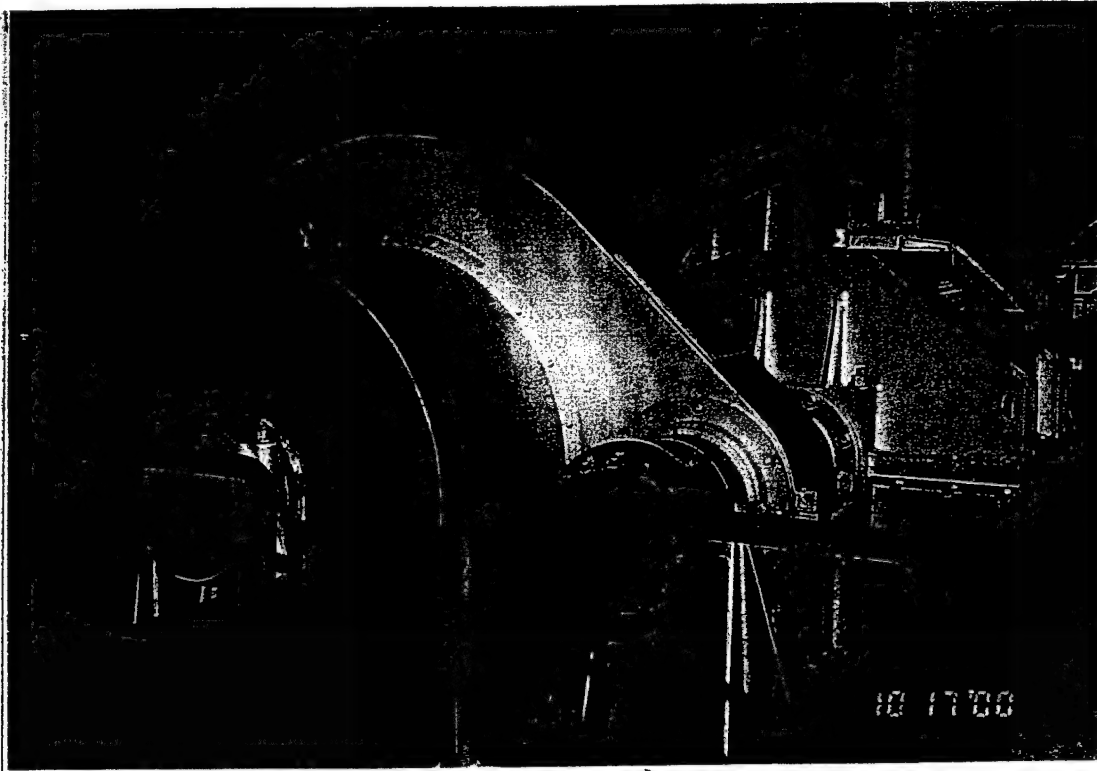
10/10/00

8-23

**Gate 8**

Cable wear plate, typical condition.  
Light to moderate corrosion, minimal  
cable wear.





Little  
Goose  
Dam

**Hoist and Mechanical**  
Hoist, typical.

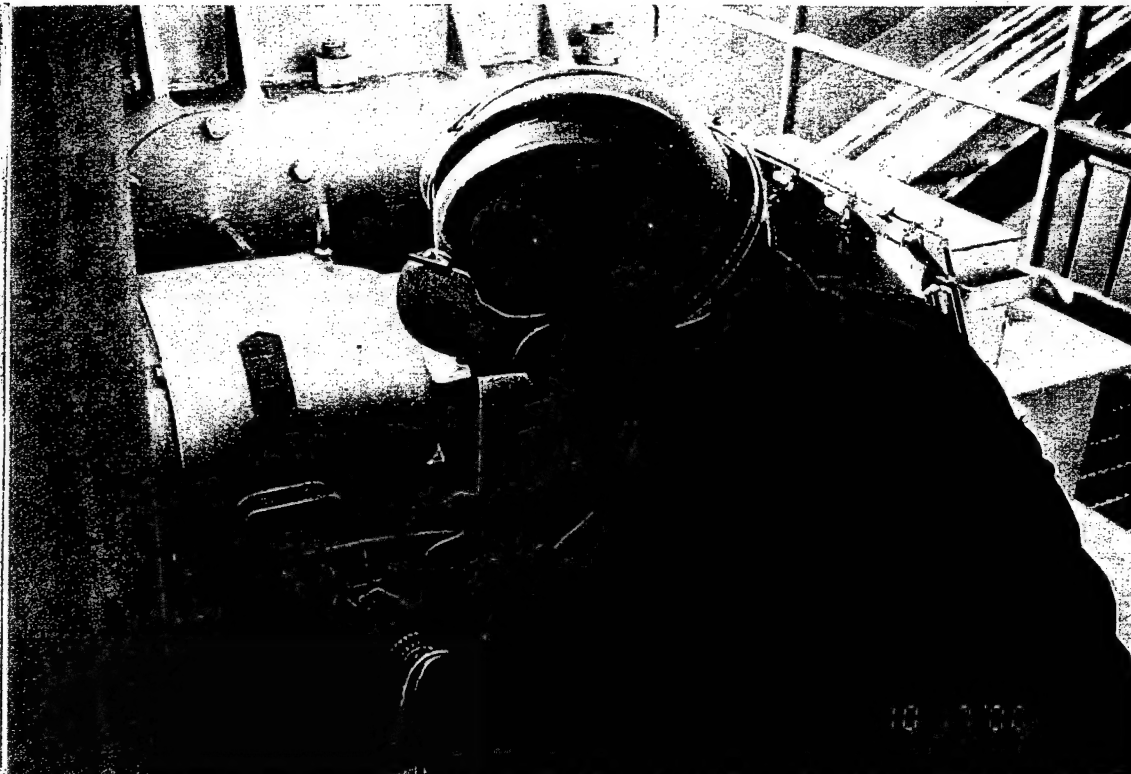
M-1



Little  
Goose  
Dam

**Hoist and Mechanical**  
Amperage readings during  
operational testing, typical.

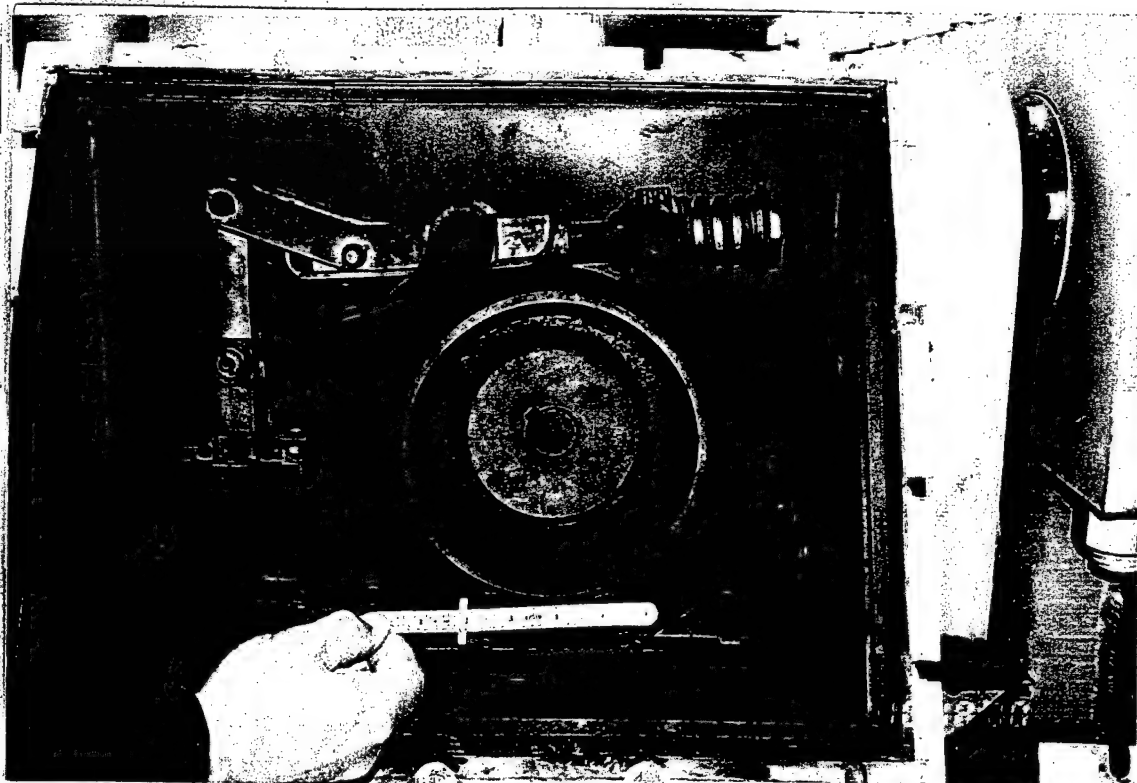
M-2



Little  
Goose  
Dam

**Hoist and Mechanical**  
Amperage readings during  
operational testing, typical.

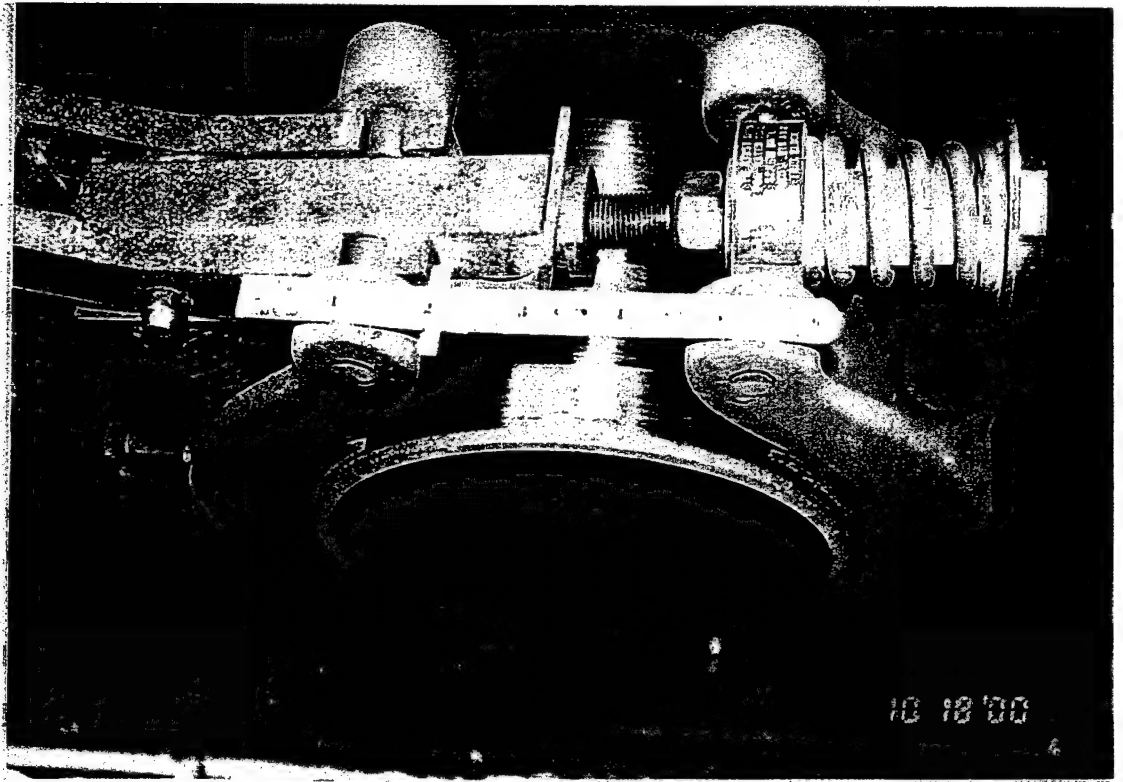
M-3



Little  
Goose  
Dam

**Hoist and Mechanical**  
Seized motor brake on Gate 6 during  
operational testing.

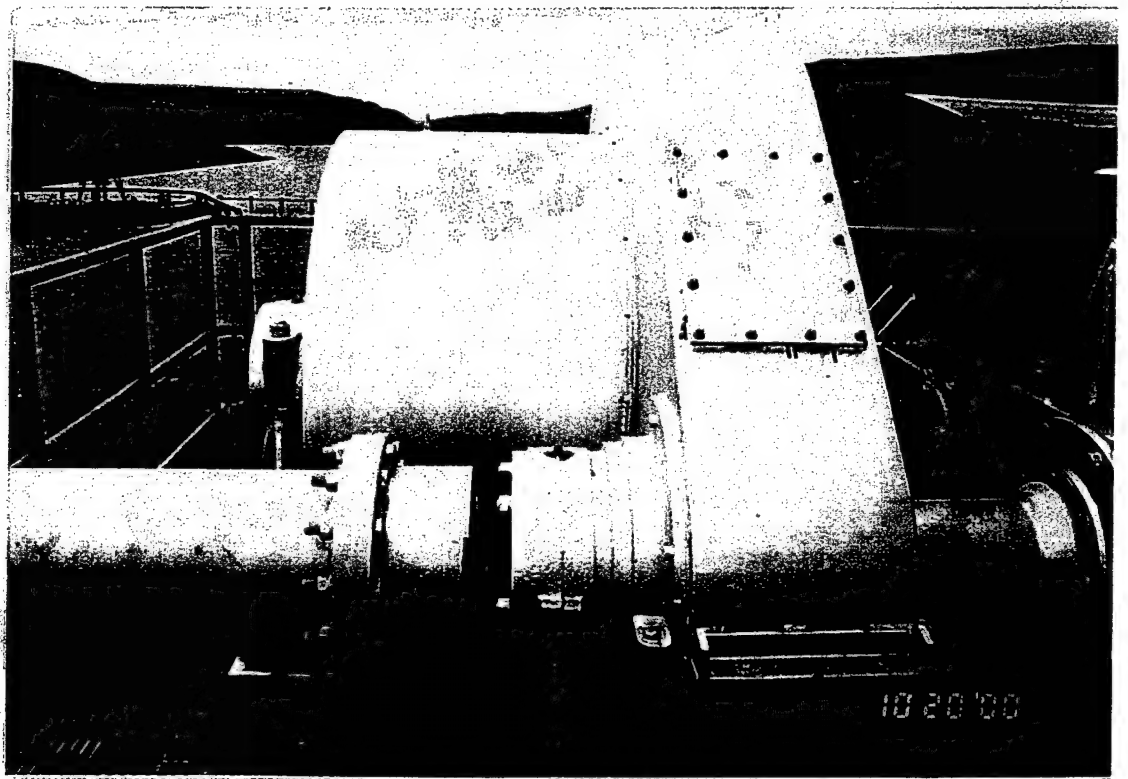
M-4



Little  
Goose  
Dam

**Hoist and Mechanical**  
Seized motor brake on Gate 6 during  
operational testing.

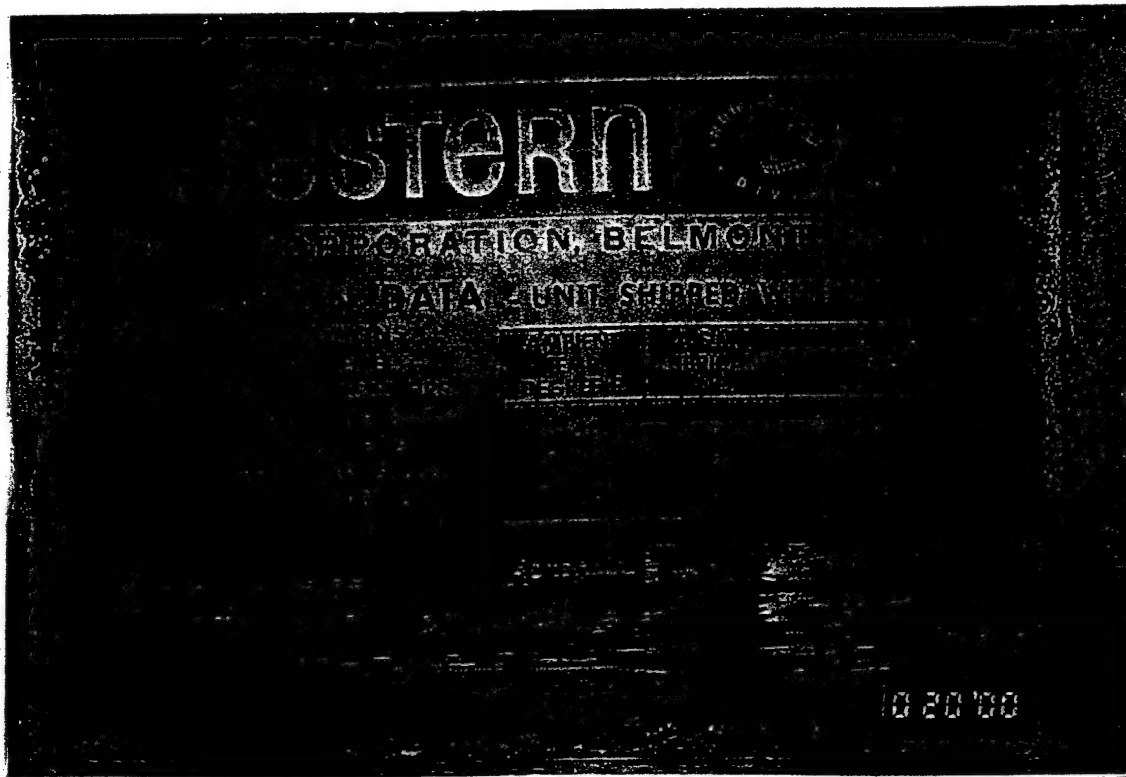
M-5



Little  
Goose  
Dam

**Hoist and Mechanical**  
Hoist, typical.

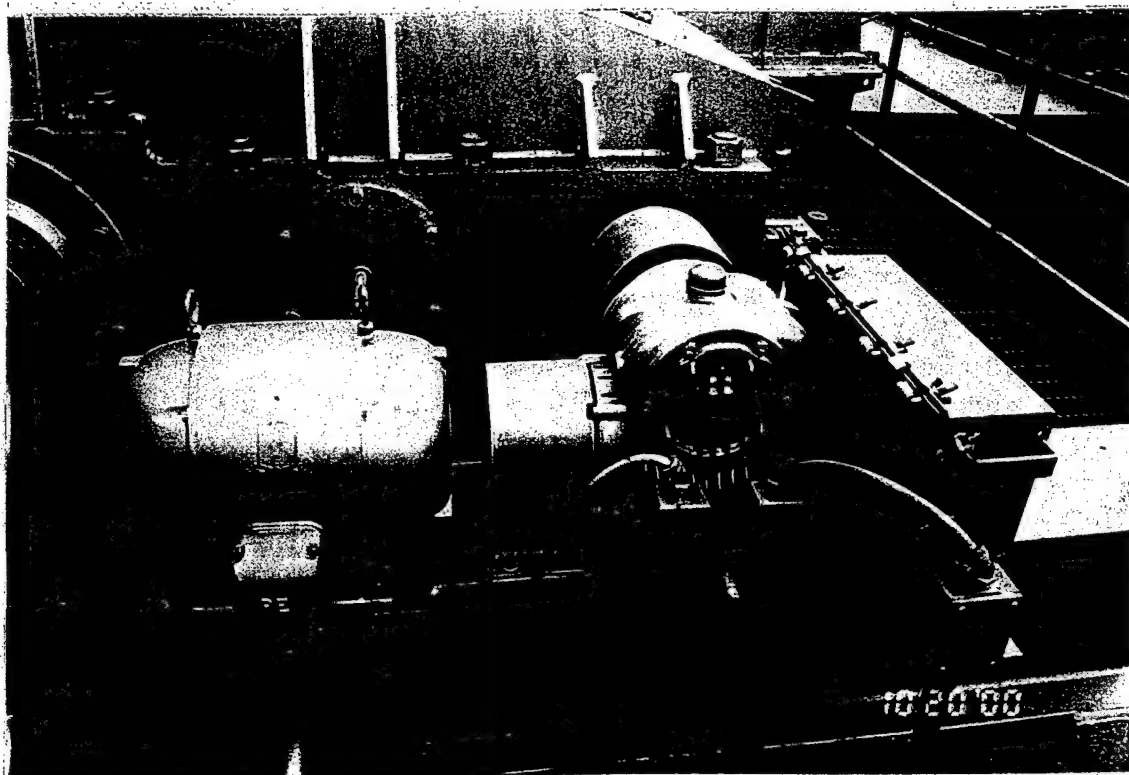
M-6



Little  
Goose  
Dam

**Hoist and Mechanical**  
Hoist, name plate, typical.

M-7



Little  
Goose  
Dam

**Hoist and Mechanical**  
Hoist, typical.

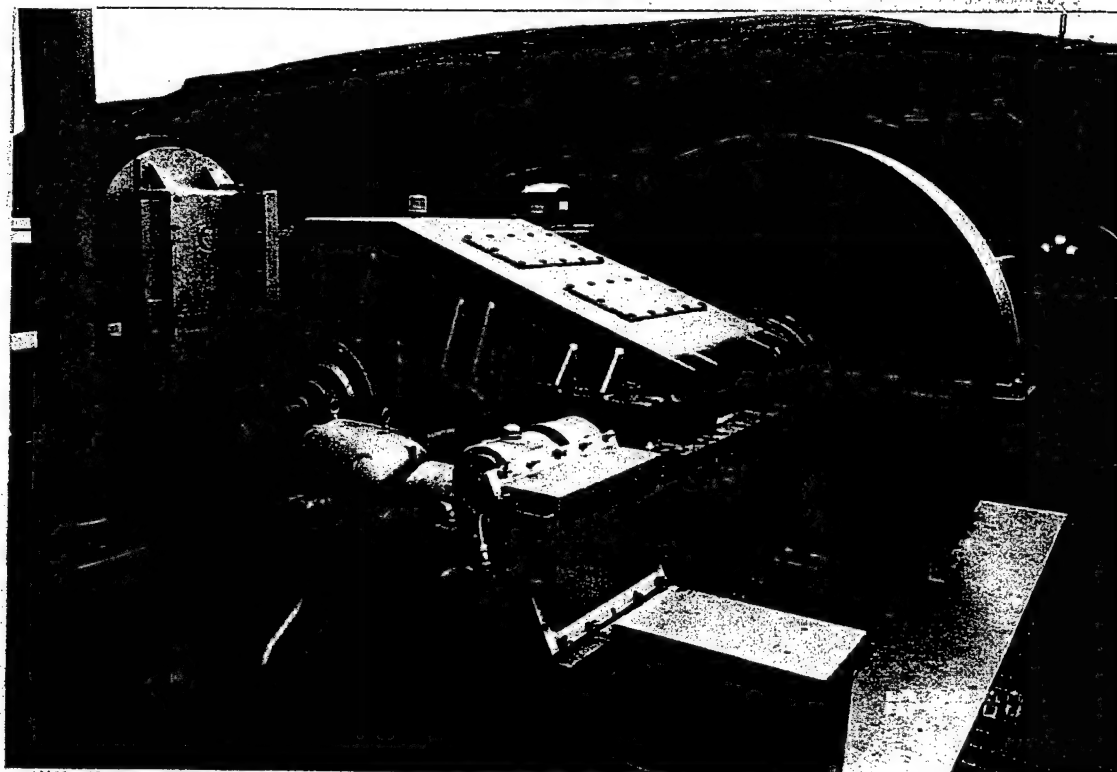
M-8



Little  
Goose  
Dam

Hoist and Mechanical  
Hoist, name plate, typical.

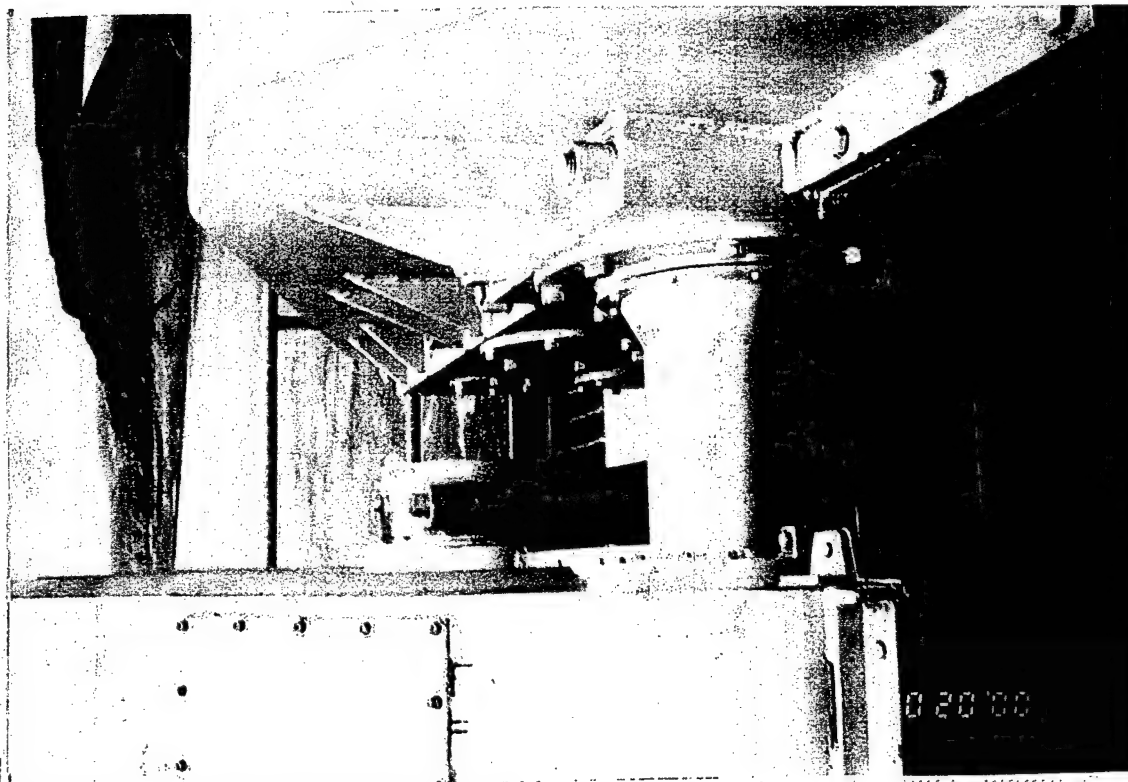
M-9



Little  
Goose  
Dam

Hoist and Mechanical  
Hoist, typical.

M-10



Little  
Goose  
Dam

**Hoist and Mechanical**  
Hoist, typical.

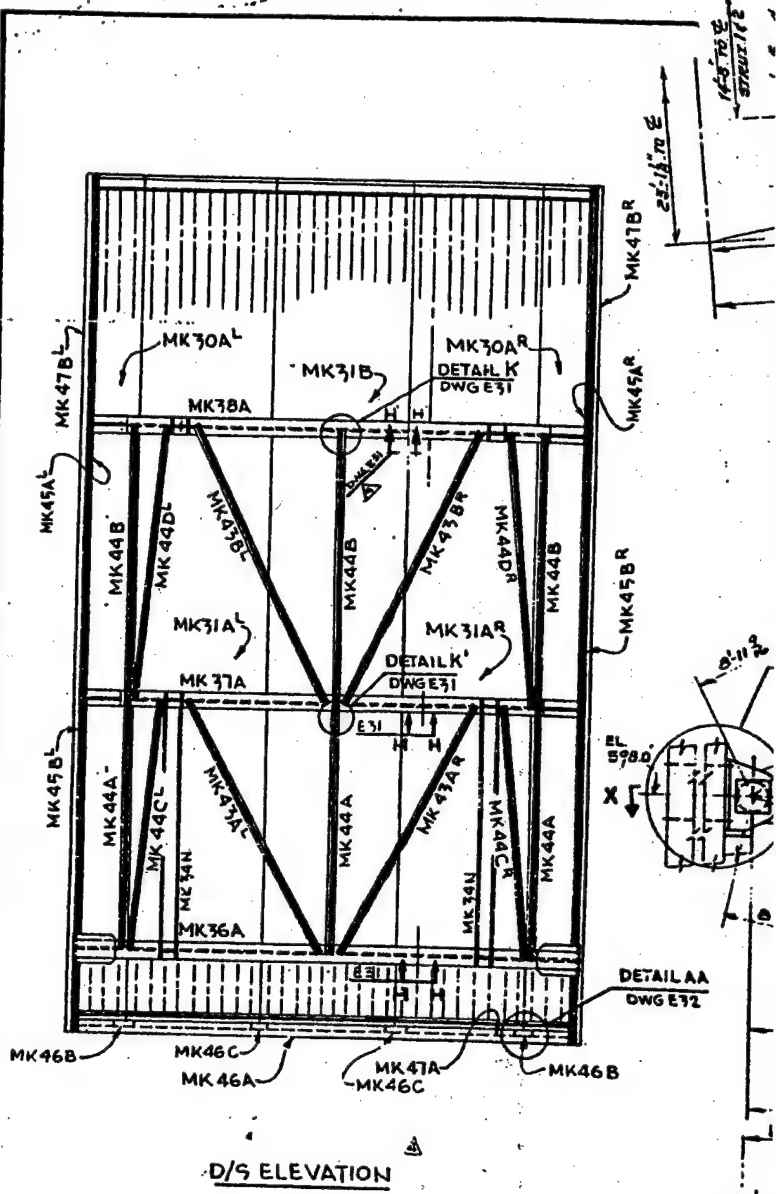
M-11

REVISIONS  
 Δ REVISED  
 TO SUIT  
 APPL  
 10-3-66  
 CANILL  
 QW

Δ ADDED  
 WORK POINT  
 DIM'S FOR  
 STRUT BRACING  
 TO ELEVATION  
 VIEW  
 4-19-67  
 H 200.  
 CANILL

Δ ADDED  
 SECT X-X  
 & GENERAL  
 DIMENSIONS  
 AT ELEV  
 5-18-67  
 JED  
 CANILL

Δ ADDED SECT  
 MARK TO SUIT  
 E31  
 7/27-67 CANILL  
 H 200.

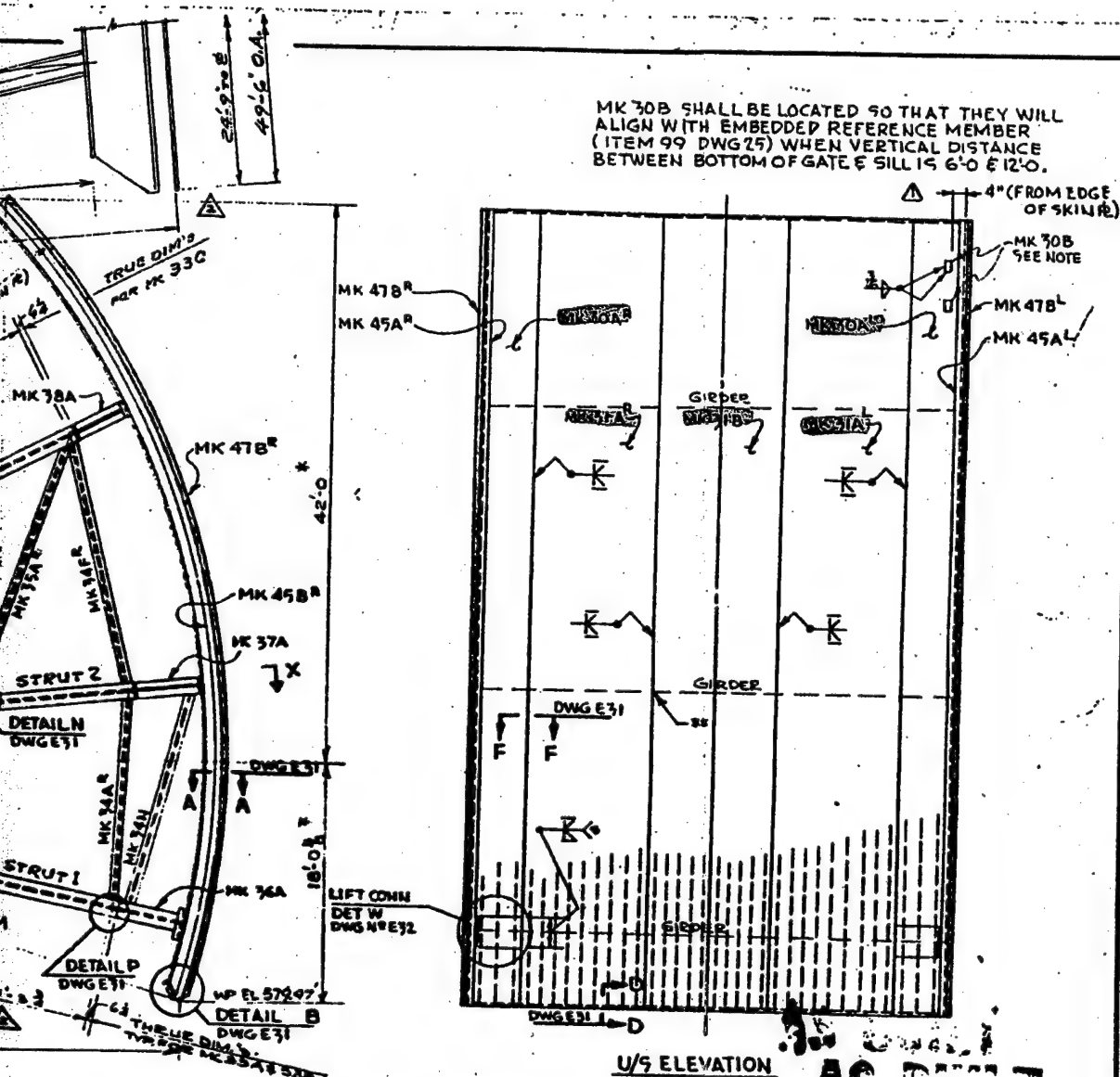


D/S ELEVATION

NOTE: SKIN & BRACES MK44A, 44B, 44C, 44D, 43A, 43B, 43C, 43D. SHOP WILL CHECK FOR FIT AT SHOP ASSY. TACK WELDING ONLY AS NECESSARY. MATCH MARK FOR SHIPPING







REFERENCE CONTD.  
CORPS OF ENGRDNG H2LGD 1-5-8/4, SHT 89 VOL I REV A  
SPEC9: PAGE TP-16-1, SECT 16

\* THIS WELD SHALL BE 100% INSPECTED BY RADIOGRAPHY  
 \*\* ALL SKIN PLATE VERTICAL SPLICES SHALL BE INSPECTED BY RADIOGRAPHY IN WAY OF GIRDERS

**CONTRACT NR DA-45-164 CIVENG-65-560**

**APPROVED**

Subject to conformity with plans and specifications, correction of errors or omissions, and to fulfillment of any required tests. Approval does not cover trial dissection, or accountability for assembling and fastening.

OFFICE OF RESIDENT ENGINEER  
LITTLE GOOSE LOCK AND DAM

DATE: 18 Aug 67

REFERENCE	DATE	BY	REMARKS
CORPS OF ENGR DWGN LGDI-5/81	5/81	SHT	85 VOL
LGDI-5/82	86		REV B
LGDI-5/83	87		REV B
LGDI-5/84	88		REV B

**NOTE:** ERECT PIECES WITH MARKS ON STEEL AT SAME END AS SHOWN ON PLAN.

**FIELD CONNECTIONS:**

**PACIFIC CAR AND FOUNDRY COMPANY**  
80 S. HUDSON ST. PA. 2-0800  
SEATTLE, WASHINGTON 98134

**LITTLE GOOSE LOCK & DAM,  
ITEM 101-SPILLWAY GATE**

FOR VINNELL, MANNIX, FULLER, DILLINGHAM			
DR. HILL	DATE 4/5/66	CHIL. (M)	DATE 5-10-66

**ERECTION** ORDER NO. C670-1010

E 30 4

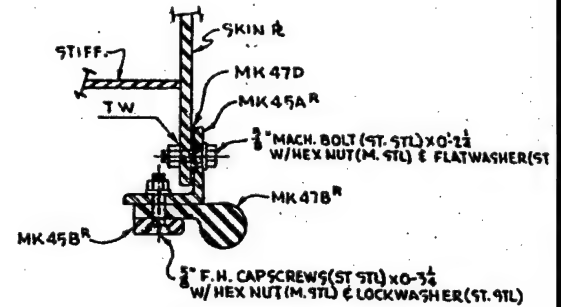
382 LTG-65-560-107001

MAR 19 1980

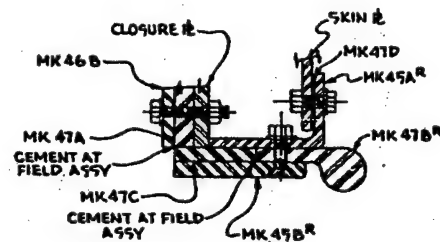
REVISIONS  
 Δ REVISED  
 TO SUIT  
 APPL  
 10-7-66  
 CANILL  
 CNU

Δ REVISED  
 DETAIL M/N  
 @ SHOP REQ.  
 4-9-67 H BOW  
 CANILL

Δ REVISED  
 EXIST. DETAIL  
 7/27/67 CAN  
 H BOW

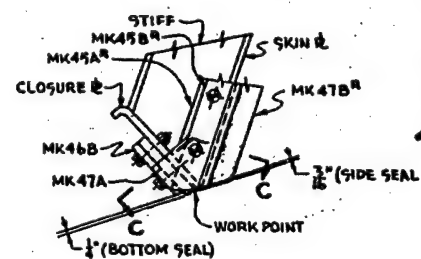


SECT. A-A



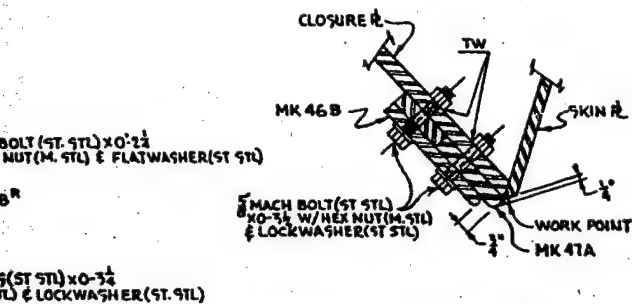
SECT C-C

TYP

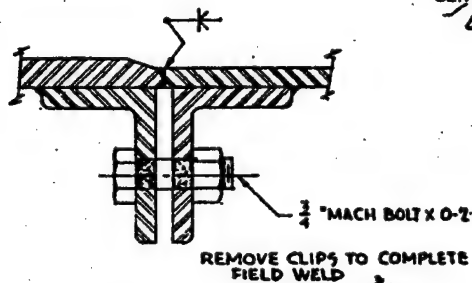


DETAIL B

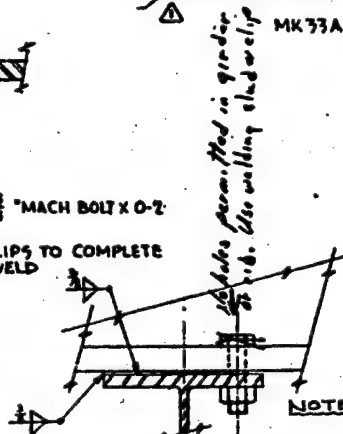
①



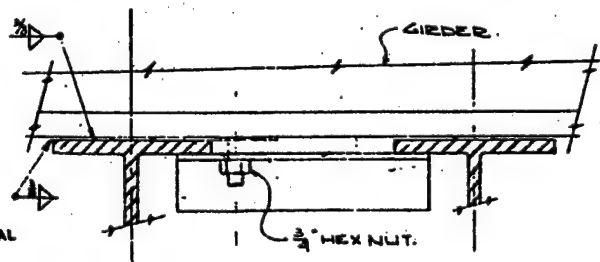
SECTION D-D



SECTION F-F  
TYP. FOR SKIN R SPLICE

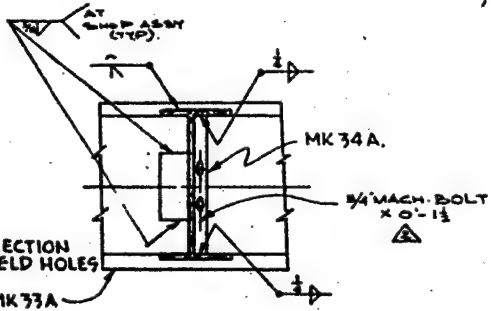


SECTION H-H (SHEET 30)  
TYPE SPLICES OF SKIN R SECTIONS

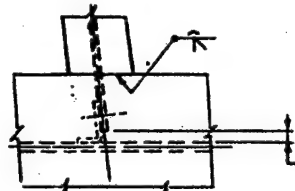


SECTION H-H  
SHEET 30

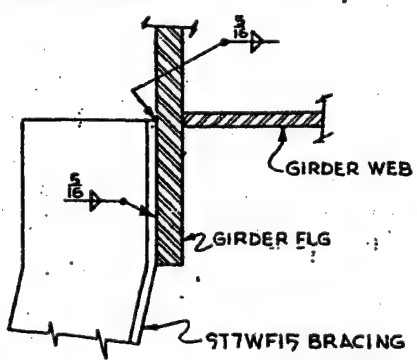
NOTE: REMOVE STUD & CLIP.  
TO COMPLETE  
FIELD WELD.



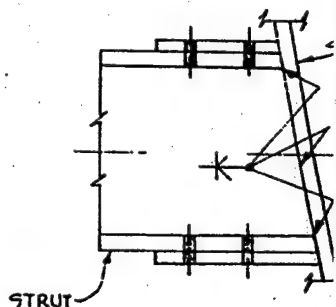
DETAIL M  
TYP FOR LOWER STRUT



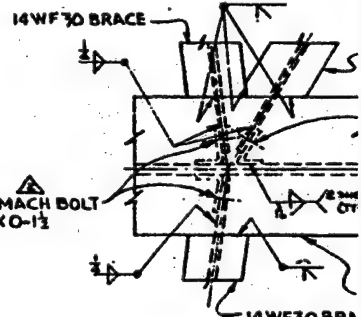
NOTE: REMOVE BOLT & PLUG WELD HOLES



DETAIL K



DETAIL P  
TYPICAL FOR U/S END OF A  
SPLICE TO GIRDERS A5N



DETAIL N  
TYP FOR CENTER STRUT  
UPPER STRUT. SIM. EXCEPT  
AS NOTED

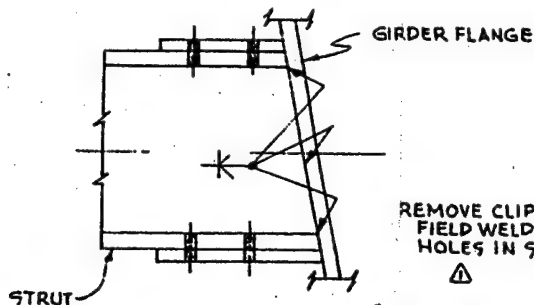
CONTRACT NO. DA-45-164 CIVENG-65-560

APPROVED  
AS CORRECTED

Subject to conformity with plans and specifications  
on revision of errors or omissions, and to full compliance  
of any required tests. Approval does not cover design,  
dimension, or suitability for application and  
performance.

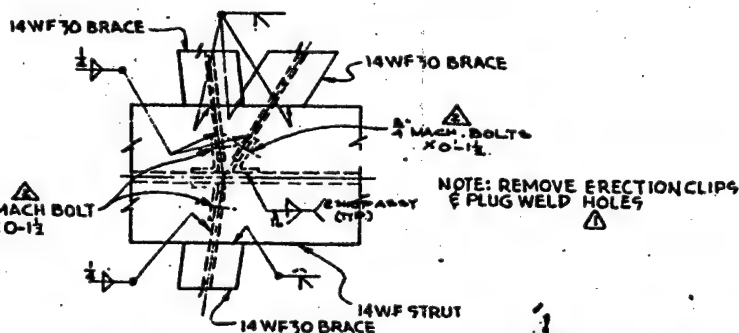
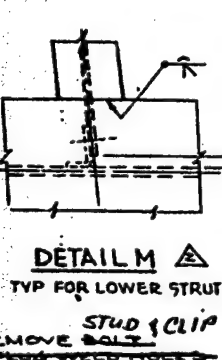
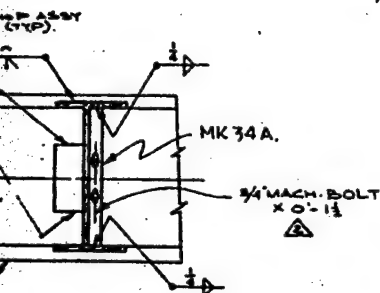
OFFICE OF RESIDENT ENGINEER  
LITTLE ROCK LOCK AND DALL

1806767  
Date: 1806767



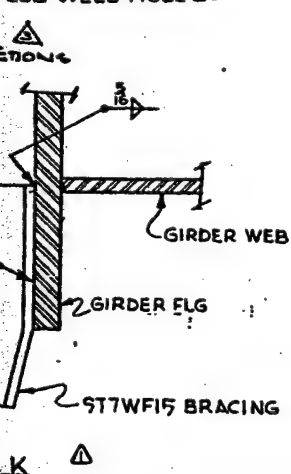
1" MACH BOLT x 0-4 1/2 (LOWER STRUT)  
1" MACH BOLT x 0-4 1/2 (CENTER STRUT)  
1" MACH BOLT x 0-3 1/2 (UPPER STRUT)

**DETAIL P**  
TYPICAL FOR U/S END OF ALL STRUT  
SPlice TO GIRDERS AS NOTED



**AS BUILT**

REFERENCE  
CORPS OF ENGR DWG LGD 1-5-81 SHT 85 VOL I REV B  
1-5-82 86  
1-5-83 87  
1-5-84 88  
1-5-85 89  
SPECs: PAGE TP-16-1, SECT. 16



CONTRACTING DA-45164 CIVENG-65-560

**APPROVED  
AS CORRECTED**

Subject to conformity with plans and specifications, correction of errors or omissions, and to fullness of any required tests. Approval does not constitute a warranty, or acceptability for any other use.

OFFICE OF RESIDENT ENGINEER  
LITTLE GOOSE LOCK AND DAM

Date: 18 Aug 67

NOTE: ERECT PIECES WITH MARKS ON STEEL AT SAME END AS SHOWN ON PLAN.

FIELD CONNECTIONS:

**PACIFIC CAR AND FOUNDRY COMPANY**  
80 S. HUDSON ST. PA. 3-0200  
SEATTLE, WASHINGTON 98134

**LITTLE GOOSE LOCK & DAM**  
ITEM 101, SPILLWAY GATE

FOR VINNELL, MANNIX, FULLER, DILLINGHAM

DR. HILL DATE 4/16/67 CONC. AW DATE 5-14-66

ERECTOR

6610-10101

E313

18 Aug 67

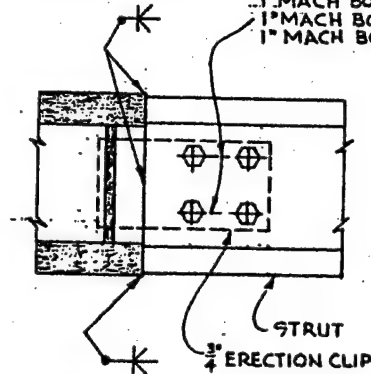
LTG-65-560-101-002 383

REVISIONS  
 Δ REVISED  
 44  
 10-3-66  
 CAHILL  
 007

Δ ADDED  
 FIELD WELD  
 DETAILS  
 CAHILL 8/7/67

# TRUNNION (MK39A<sup>R</sup>)

1" MACH BOLT X 0-4" (LOWER STRUT)  
 1" MACH BOLT X 0-3 1/4" (CENTER STRUT)  
 1" MACH BOLT X 0-3 1/4" (UPPER STRUT)



REMOVE CLIP TO COMPLETE FIELD  
 WELD-PLUG WELD HOLES IN WEB

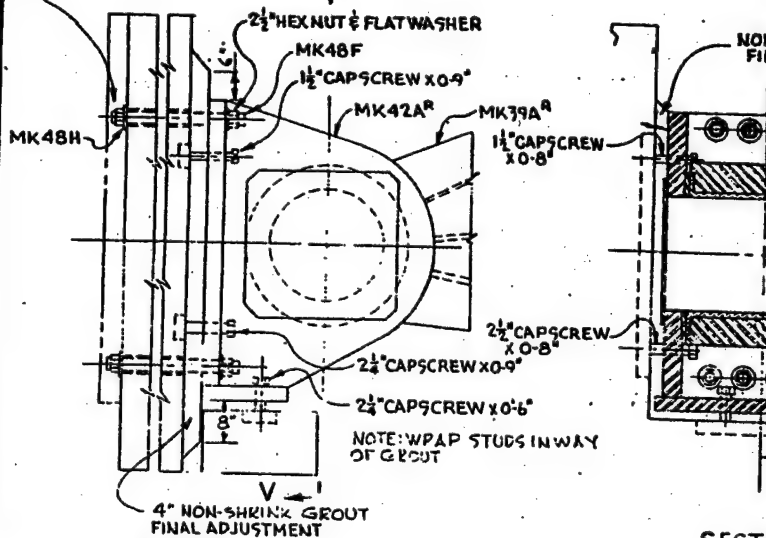
Δ LIFT ROPI  
 (NOT BY P.)

## SECT 9-9

MK41C  
 1/2" MACH BOLT  
 X 0-1 1/2" (NON)

SPACERS (N  
 BY P.C.E.F.C

TENSION STUDS TO A 80 KIP LOAD, CUT  
 OFF EXCESS STUD AFTER TENSIONING  
 & COVER WITH 1" MIN CONCRETE OVER  
 ENDS OF STUDS. (AFTER GROUTING)

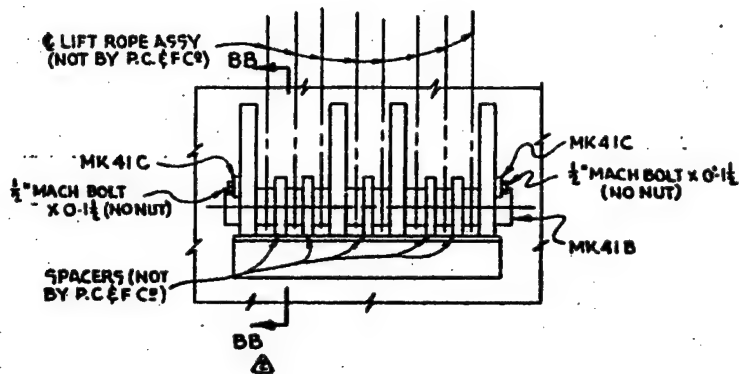


## Δ DETAIL T

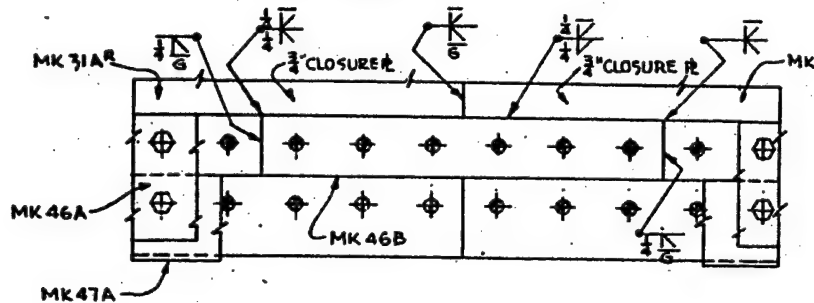
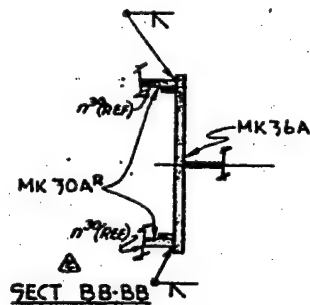
## SECT.

1

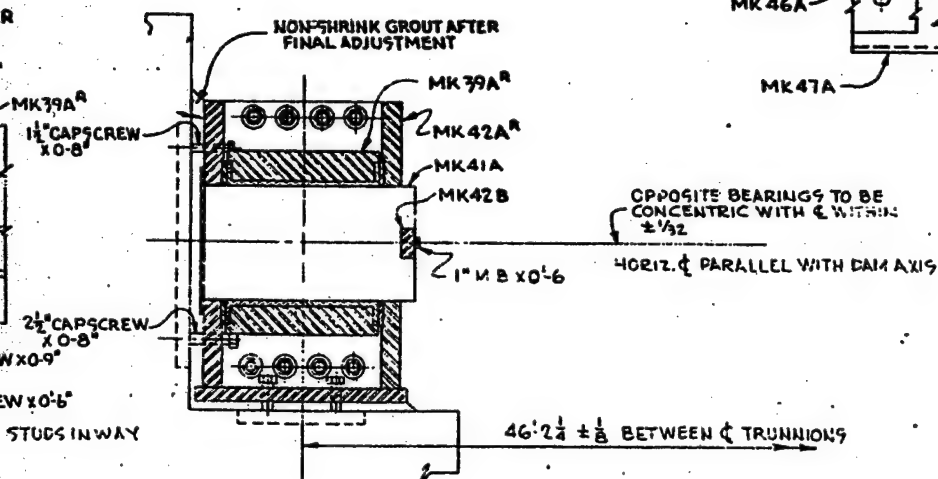
x 0-4 (LOWER STRUT)  
 x 0-3 (CENTER STRUT)  
 x 0-3 (UPPER STRUT)



**DETAIL W**



**DETAIL A-A**  
TYPICAL FOR ALL SPLICES



**SECTION V-V**

CONTRACT NO. DA45-164 CIVENG 6-2

**APPROVED**

Subject to conformity with plans and specifications, correction of errors, and approval, and to satisfaction of any required tests, and to the satisfaction of the Engineer, the Contractor shall be responsible for the quality and quantity of the work.

OFFICE OF THE ENGINEER  
LITTLE ROCK, ARK.

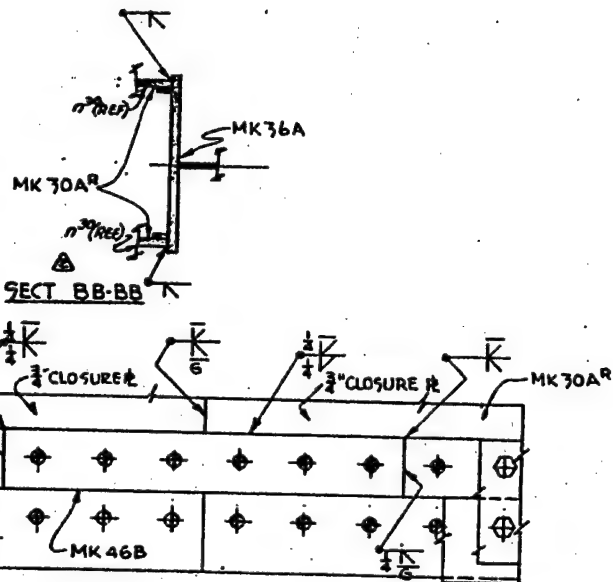
21 Sep 67

Date: 21 Sep 67

LTC

2





DETAIL A-A  
TYPICAL FOR ALL SPLICES

REFERENCE: **AS BUILT**  
CORPS OF ENGR DWG LGD 1-5-81, SHT 85, VOL 1, REV B  
1-5-8/2  
1-5-8/3  
1-5-8/4  
1-5-8/5  
SPECS; PAGE TP-101, 58016

CONTRACT NO DA45-164 CIVENG 65-560

**APPROVED**  
Subject to conformity with plans and specifications, correction of errors, and additions and deletions of any required details, the undersigned hereby approves the design and construction of the above described work.  
OFFICE OF THE CHIEF OF ENGINEERS  
LITTLE GOOSE LOCK AND DAM  
Date: 21 Sep 67

Not Avail. Sub M.E. M.E. M.E. M.E.	<p><b>NOTE:</b> ERECT PIECES WITH MARKS ON STEEL AT SAME END AS SHOWN ON PLAN.</p> <p>FIELD CONNECTIONS:</p>
<p><b>PACIFIC CAR AND FOUNDRY COMPANY</b> 80 S. HUDSON ST. P.O. 2-6886 SEATTLE, WASHINGTON 98134</p>	
<p><b>LITTLE GOOSE LOCK DAM</b> ITEM 101 SPILLWAY GATE FOR VINNELL, MANNIX, FULLER, DILLINGHAM DR. WILL. DATE 11/69 CHL. DATE 3-18-66</p>	
<p><b>ERECTION</b> C670-10101</p>	
<p>APPROVED: <i>P.D. Knudson</i> E322</p>	

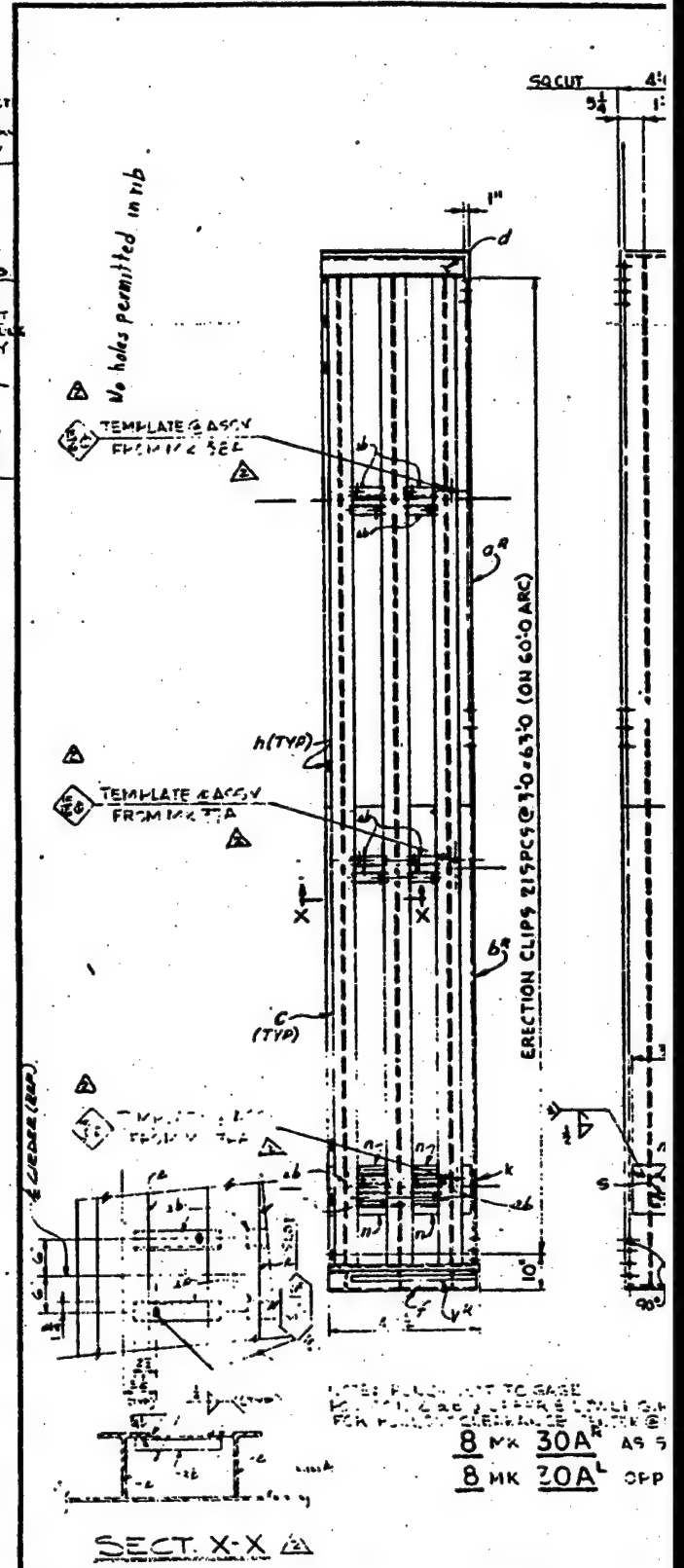
LIG-65-560-101-003 384

MAR 19 1980

3

△ ADDED  
BACKDP BAR  
FOR REVISED  
FIELD WHD  
10/23/87 CM

SECT. X-X 



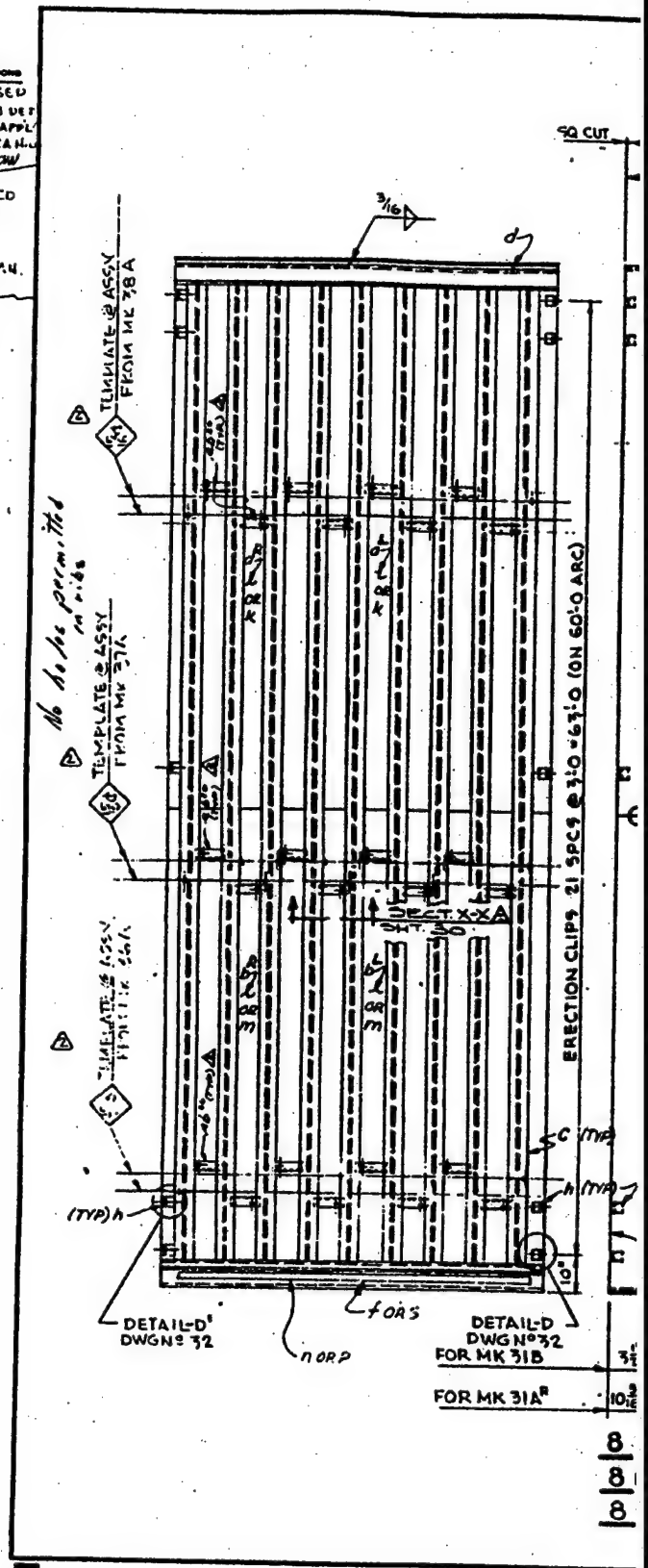




REVISIONS  
 Δ REVISED  
 ERECTION DET  
 TO SUIT APPL  
 10-1-66 C.A.H.  
 DW

Δ REVISED  
 ERECTION  
 DETAIL

7/27-67 C.A.H.



1





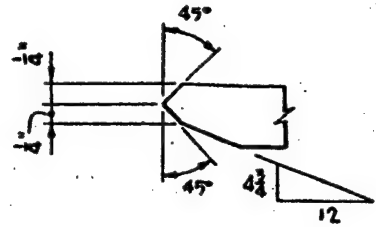


REVISIONS  
 Δ ADDED  
 EJECTION  
 CLIP DETAIL  
 10-1-66 CAN  
 JMW

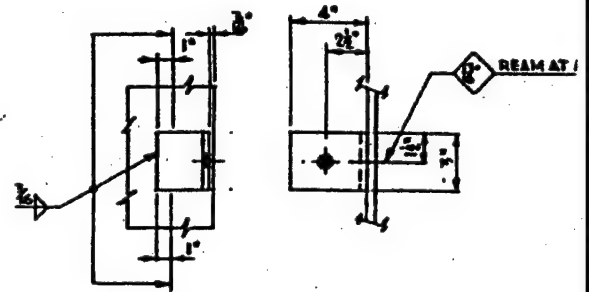
Δ DELETED  
 EJECTION  
 DETAIL

7/11/67 CAN

Δ REVISED  
 EDGE DETAIL  
 FC 9-5-69  
 FIELD WELD  
 8/23/67 CAN



SECT K-K DWG NO 30

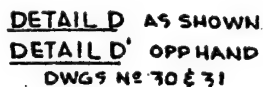
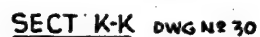


DETAIL D AS SHOWN  
DETAIL D' OPP HAND  
 DWGS NO 30 & 31

GRIND SMOOTH

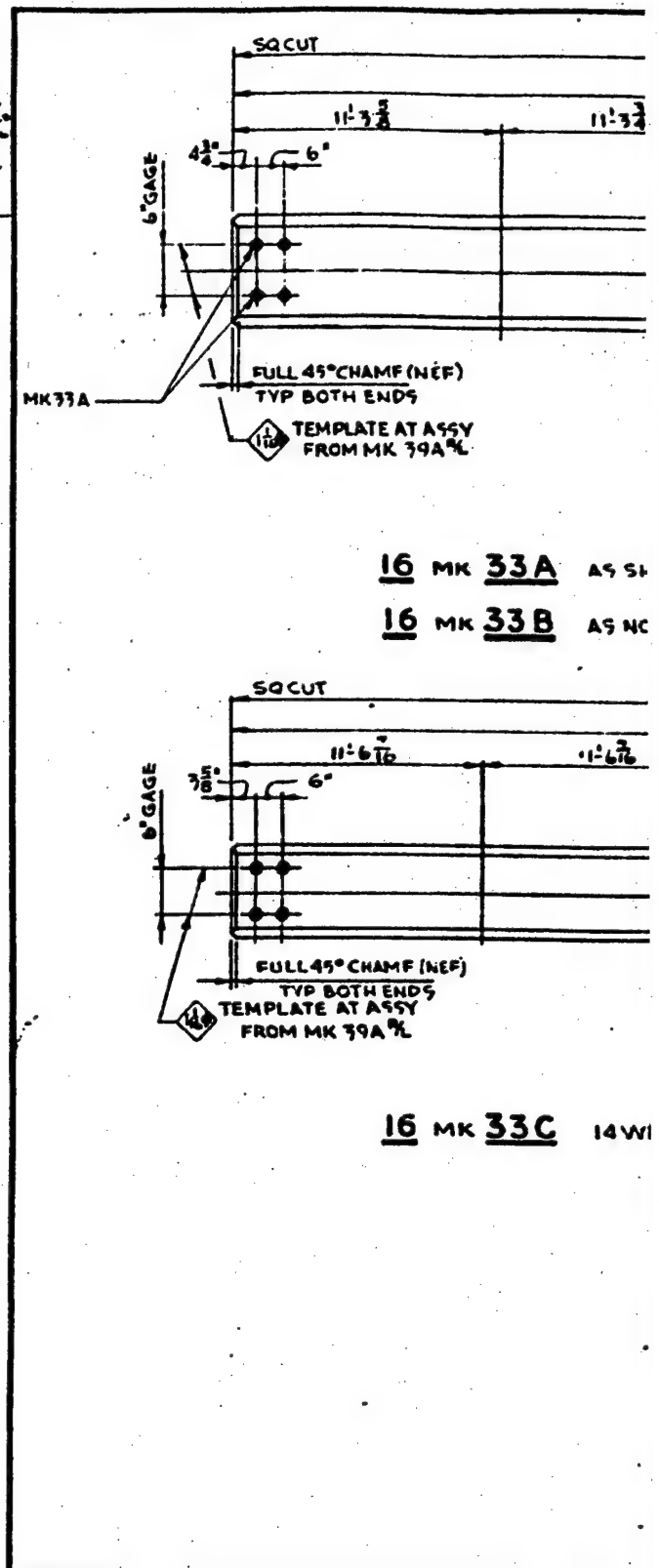
D

1

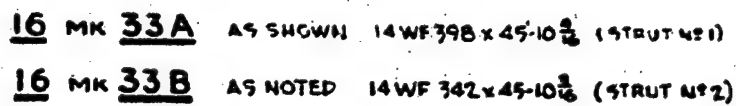




REVISIONS  
 Δ DELETED  
 ALL 1/2" HOLES  
 FROM WEB OF  
 MK 33A,  
 33B & 33C.  
 4-13-67  
 H.B.O.  
 C.H.U.



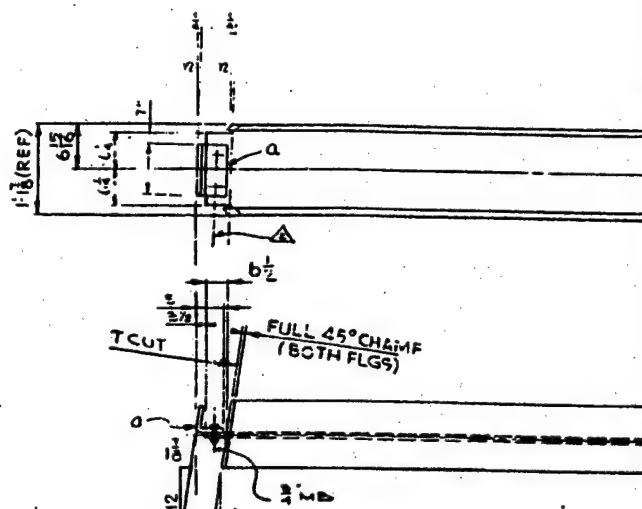
(1)



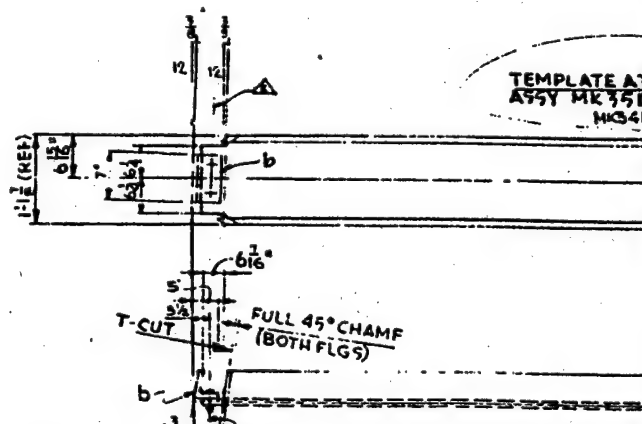


REVISIONS  
 Δ REVISED  
 TO SUIT CO 44  
 10-3-66 CANAL

Δ REVISED  
 REFC. CLIP  
 FROM WELDED  
 TO BOLTED  
 8 SHIP REC.  
 1-18-67 M.D.P.  
 CANAL



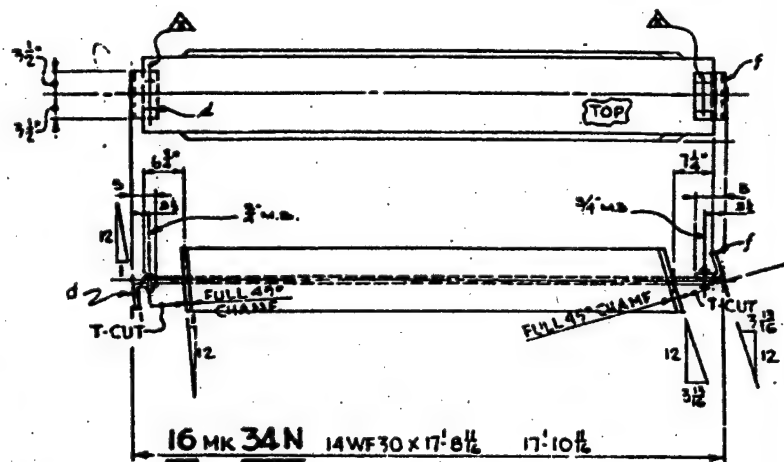
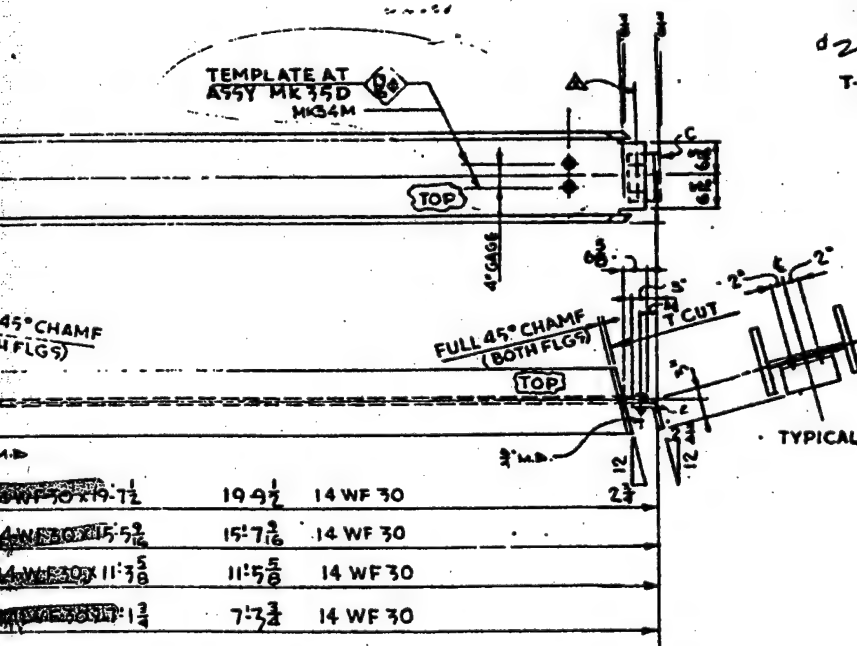
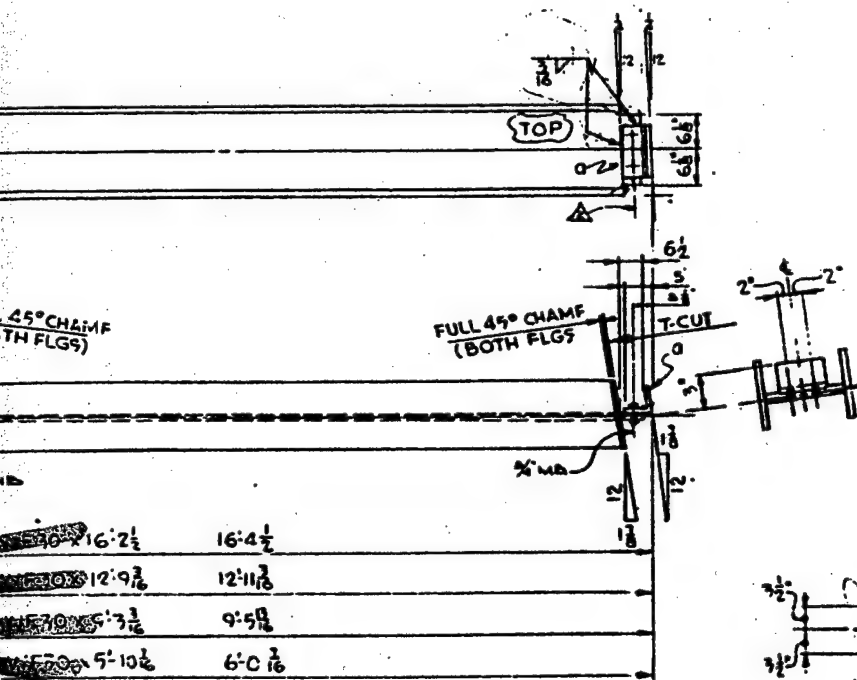
8MK 34A <sup>R</sup> AS SHOWN		
8MK 34A <sup>L</sup> OPP HAND	16'-4 1/2"	
8MK 34B <sup>R</sup> AS SHOWN	12'-11 1/8"	
8MK 34B <sup>L</sup> OPP HAND	9'-5 5/8"	
8MK 34C <sup>R</sup> AS SHOWN	6'-0 3/16"	
8MK 34C <sup>L</sup> OPP HAND		
8MK 34D <sup>R</sup> AS SHOWN		
8MK 34D <sup>L</sup> OPP HAND		



8MK 34F <sup>R</sup> AS SHOWN		
8MK 34F <sup>L</sup> OPP HAND	19'-9 1/2"	14'
8MK 34H <sup>R</sup> AS SHOWN	15'-7 3/16"	14'
8MK 34H <sup>L</sup> OPP HAND	11'-5 5/8"	14'
8MK 34K <sup>R</sup> AS SHOWN	7'-3 3/4"	14'
8MK 34K <sup>L</sup> OPP HAND		
8MK 34M <sup>R</sup> AS SHOWN		
8MK 34M <sup>L</sup> OPP HAND		

①





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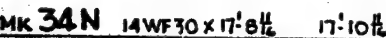
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Subject to conformity of  
correction of errors or  
of any required tests, as  
determined, or agreed  
between.

OFFICE OF THE  
LITTLE ROCK, AR

6-

2



CONTRACT NO. DA45-168 CTVENG65-56

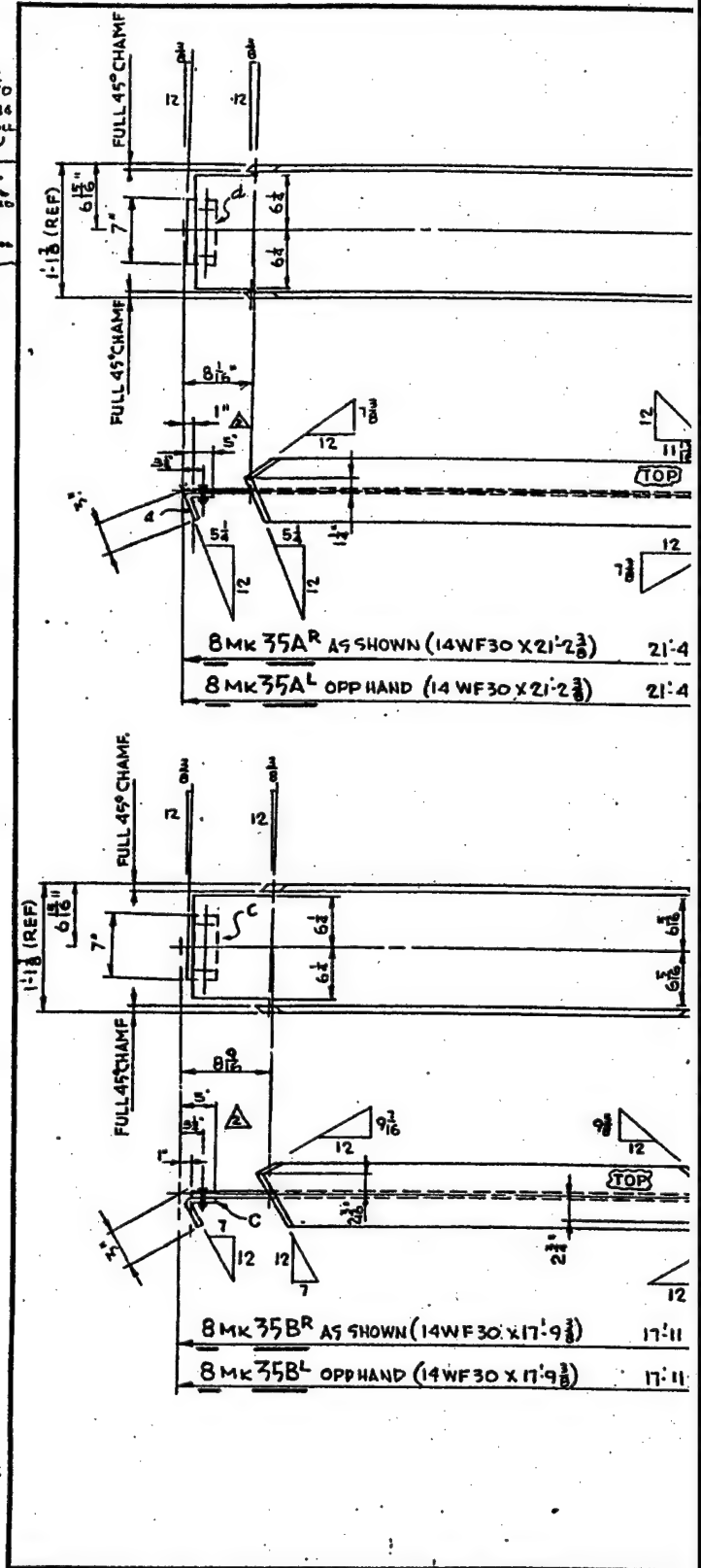
6-5-67

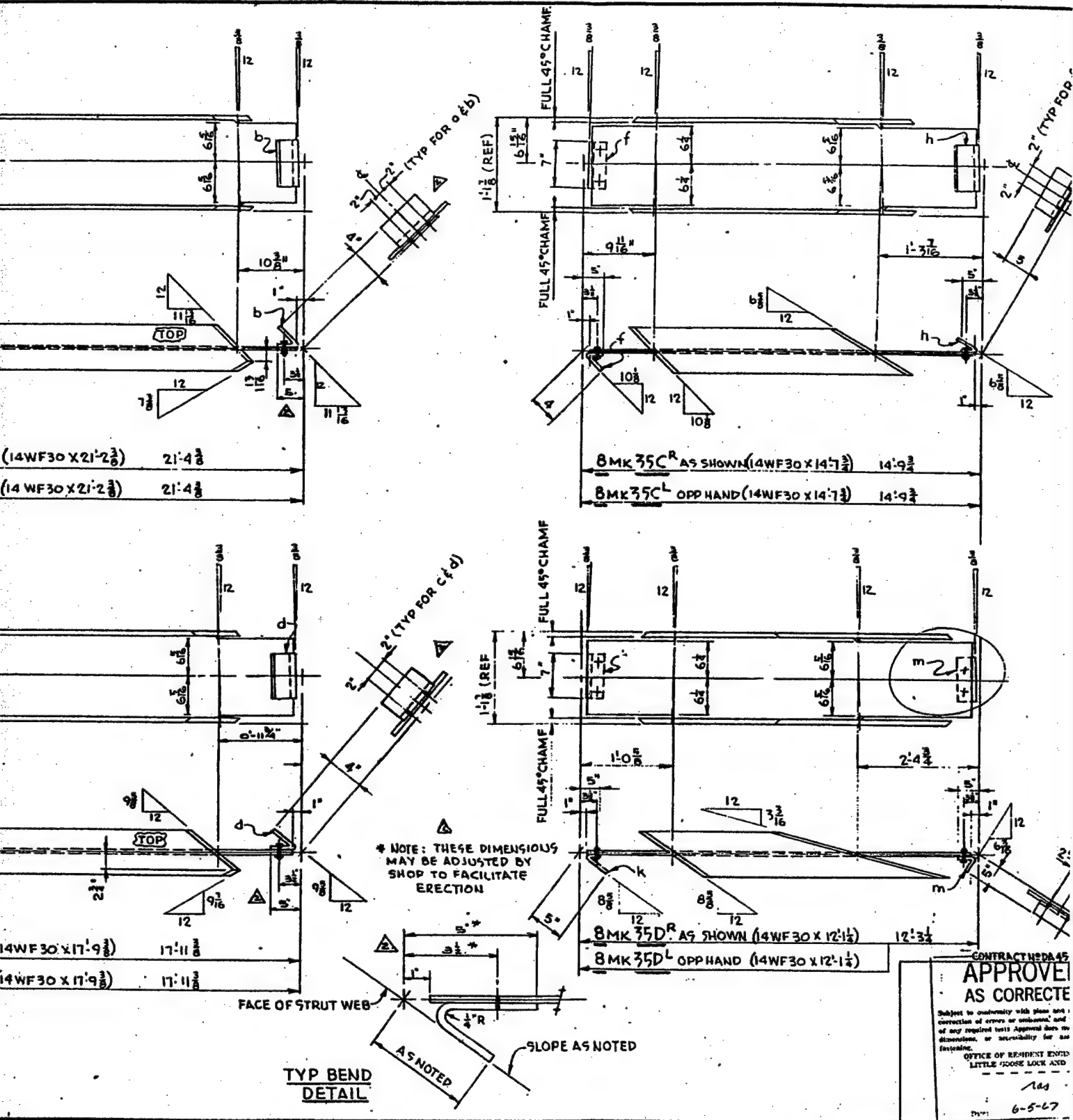
15-560-101-008 389

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△ REVISED  
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TO BOLTED  
@ SHOP REQ.  
4-19-67. W BOLL  
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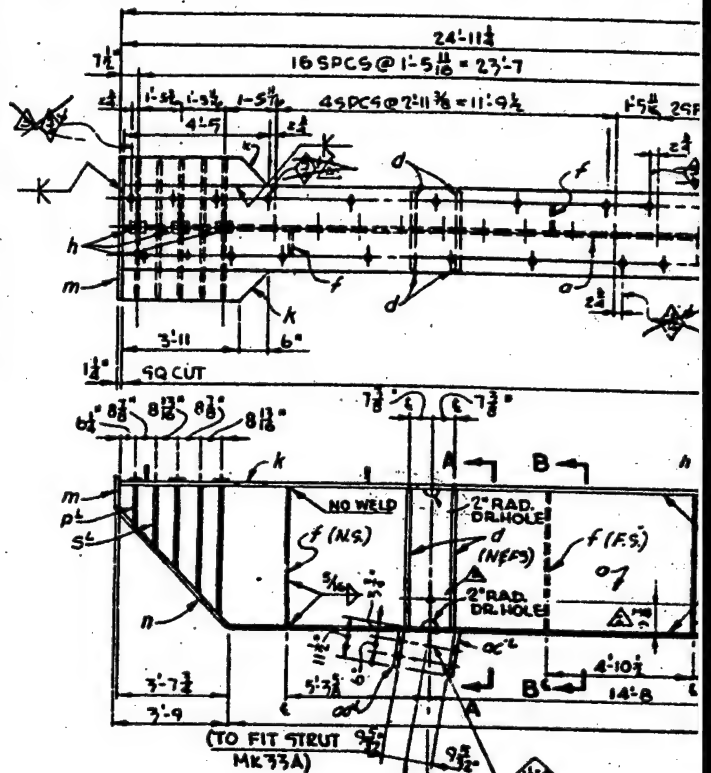




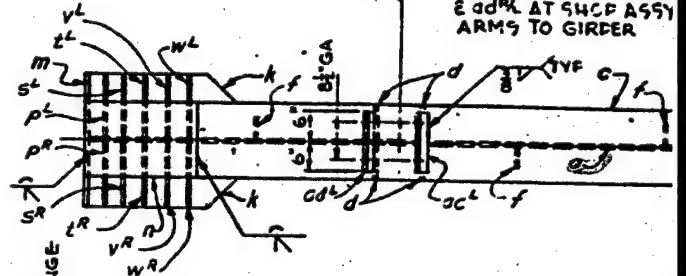
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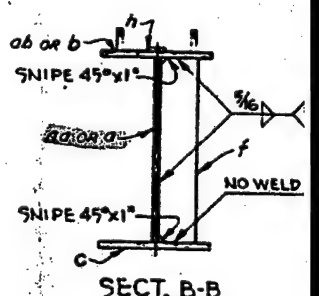
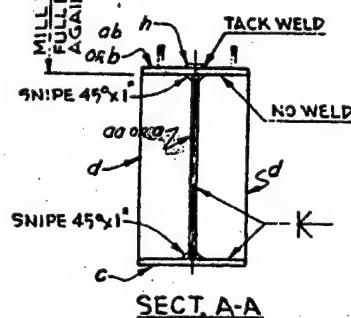
REVISIONS  
 Δ REVISED ERECTION DET TO SUIT 10-3-66 CAMILL  
 Δ DELETED 1/2" DIA. HOLES FROM WEB OF GIRDER. 2 SHIP REQ. 4-19-67 M. BOB CAMILL  
 Δ DELETED 8-CP STUDS ADDED 8- 7/16" DIA. HOLES TO SUIT HIGH BOB. CHILL



NOTE—  
 SUGGESTED PROCEDURE  
 E 00% AT SHCP ASSY  
 ARMS TO GIRDER



8 MK 36A GIRDER ASSY IN









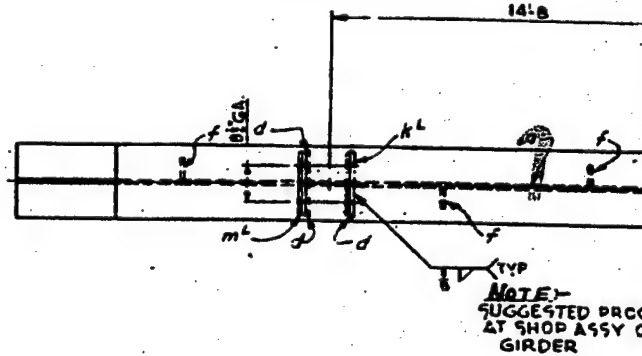
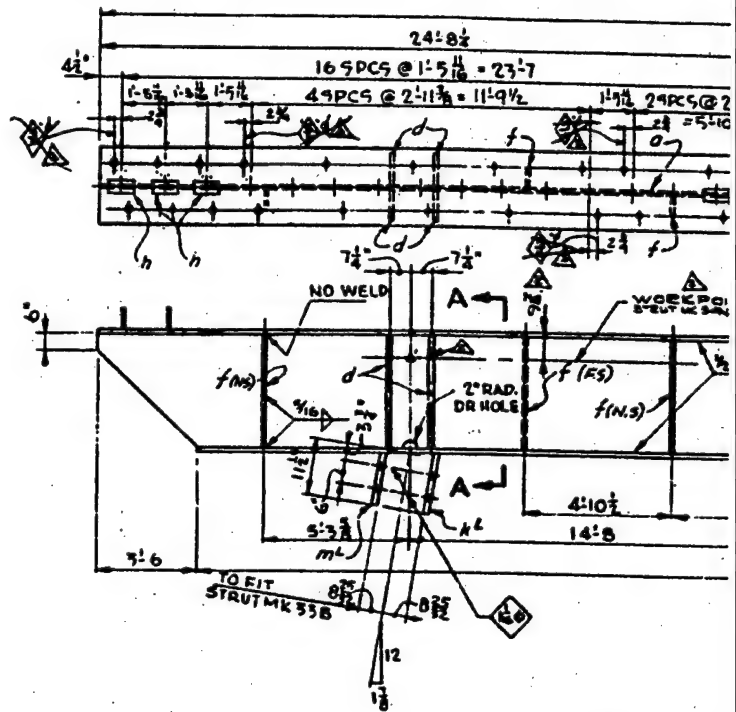
MATERIAL SPEC: Total 184 398  
 PLATE 6 BAR ASTM-A36 EXCEPT AS NOTED  
 PLATE LOW ALLOY STL-SEE PAGE TP-4-38,  
 PARA 9-09 OF GEN. SPEC.  
 MACH BOLTS ASTM A307 GRA  
 WELD STUDS - MFRS STD

REFERENCE:  
CORPS OF ENGR DWG NO LGDI-5-8/2 SHT 86 VOL I REV B  
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓  
SPEC. PAGE TP-16-1, SECT 16  
↓ ↓ TP-9-38, PARA 9-09

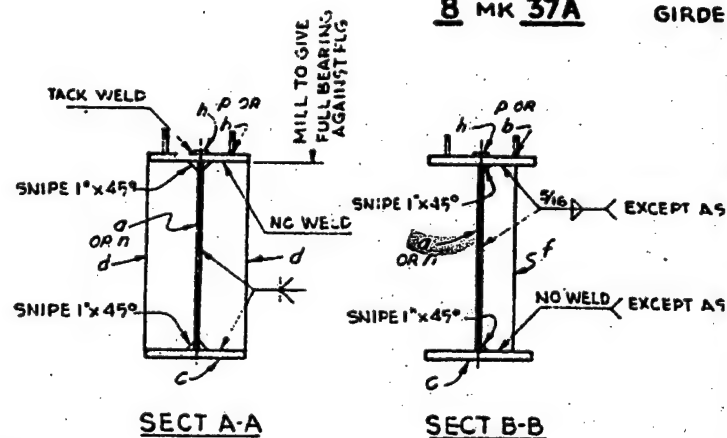
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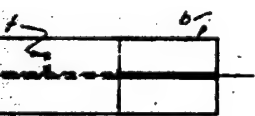
A DELETED  
 B- CDF. 37JBB  
 & ADDED B-  
 15/16 DIA. HOLE  
 TO SUIT.  
 7/29. 67 M BAY  
 CALIF.



8 MK 37A      GIRDE







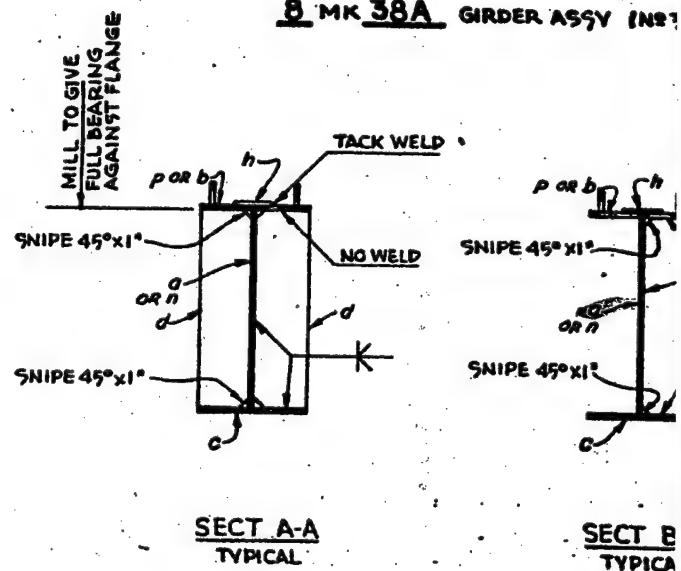
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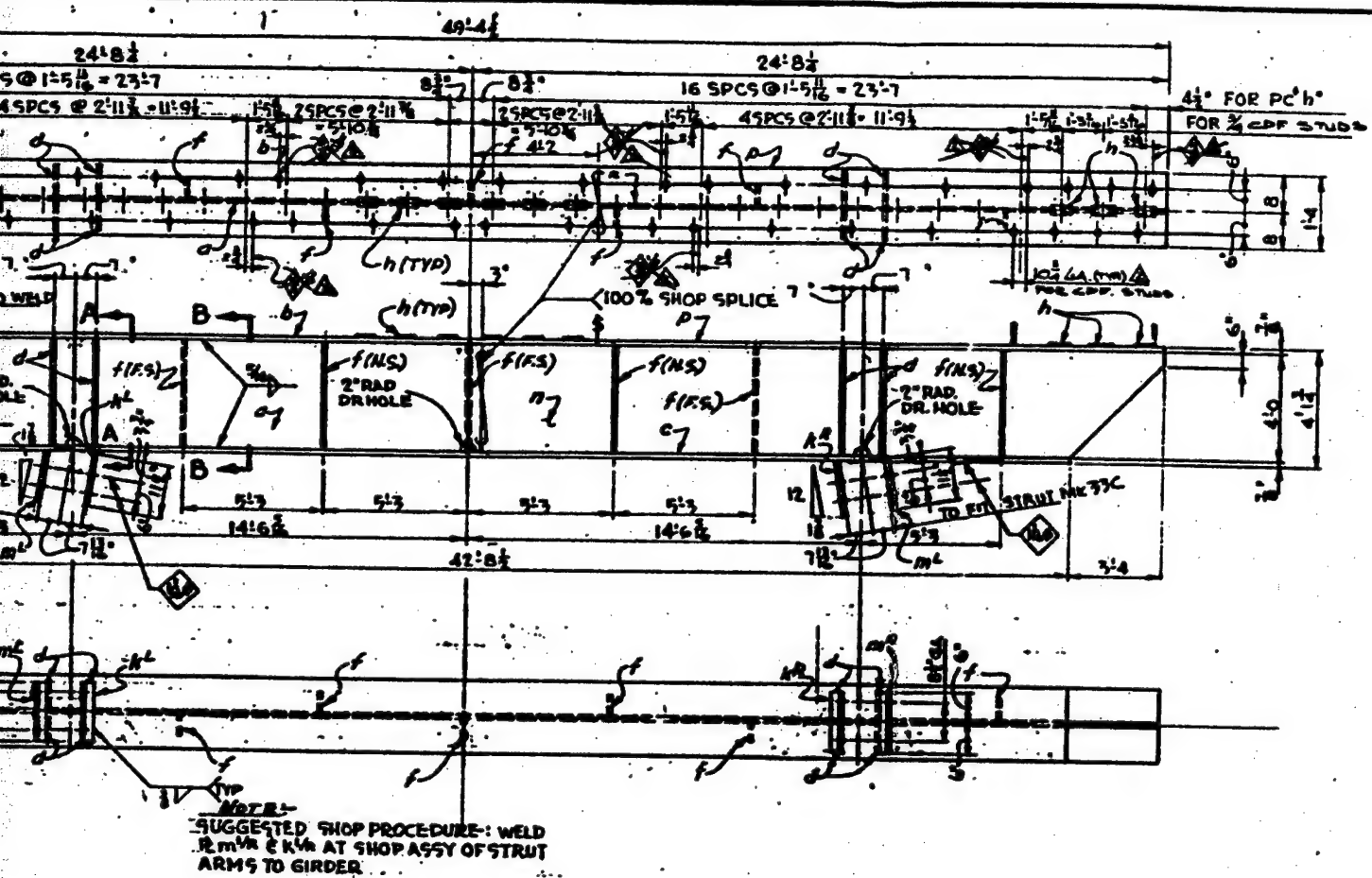
total	126 762
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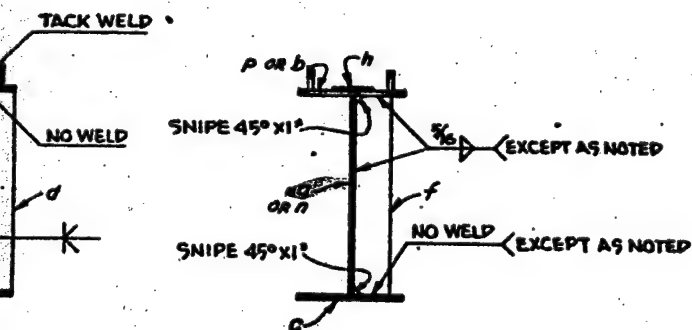
LYG-65-560-101-011 392

A DELETED.  
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**1 MK 38A GIRDER ASSY (Nº 3)**



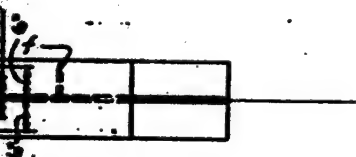
CONTRACT NO. DA-454

**APPROVED  
AS CORRECT**

Subject to conformity with plans & correction of errors or omission, & of any required tests. Approval does not constitute, or responsibility for, inspection.

OFFICE OF RESIDENT ENGINEER  
LITTLE ROCK, ARK.

DATE: 1/20/51



MATERIAL SPEC:  
 PLATE & BAR ASTM-A36 EXCEPT AS NOTED.  
 PLATE LOW ALLOY STL SEE PG TP-9-38,  
 PARA 9-09 OF GEN. SPEC.  
 WELD STUDS MP-2, STD.

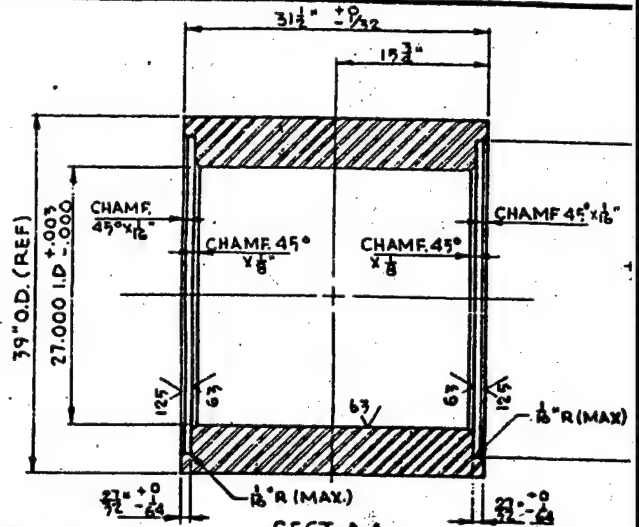
# AS BUILT

100-560-101-012 39



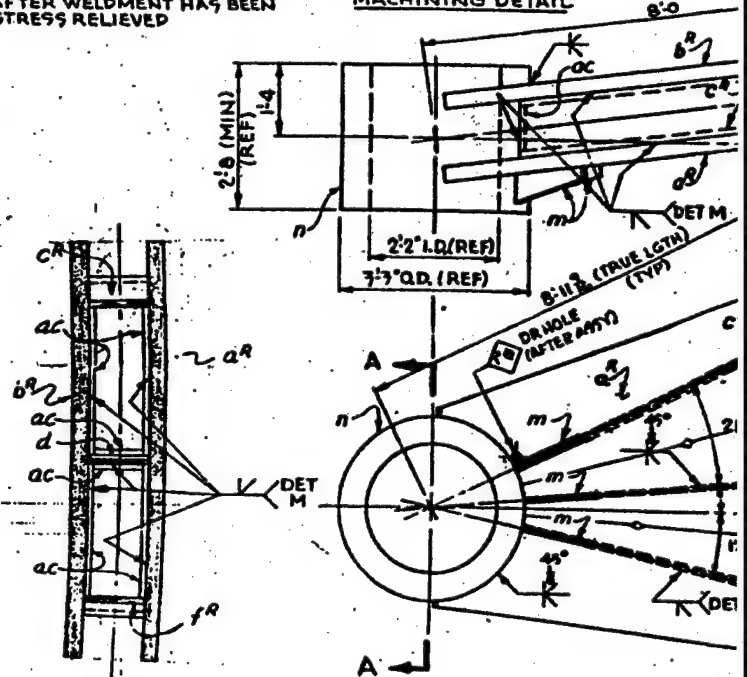
REVISOR  
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 TO SUIT  
 C.O. #18  
 10-5-66  
 CAHILL  
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REVISOR  
 Δ REVISED  
 WELD DET. M  
 TO SUIT COE  
 DESIGN DWG  
 JS. 10/4/67  
 CAN



NOTE:  
 MACHINING TO BE COMPLETED  
 AFTER WELDMENT HAS BEEN  
 STRESS RELIEVED

SECTION A-A  
 MACHINING DETAIL



SECTION D-D

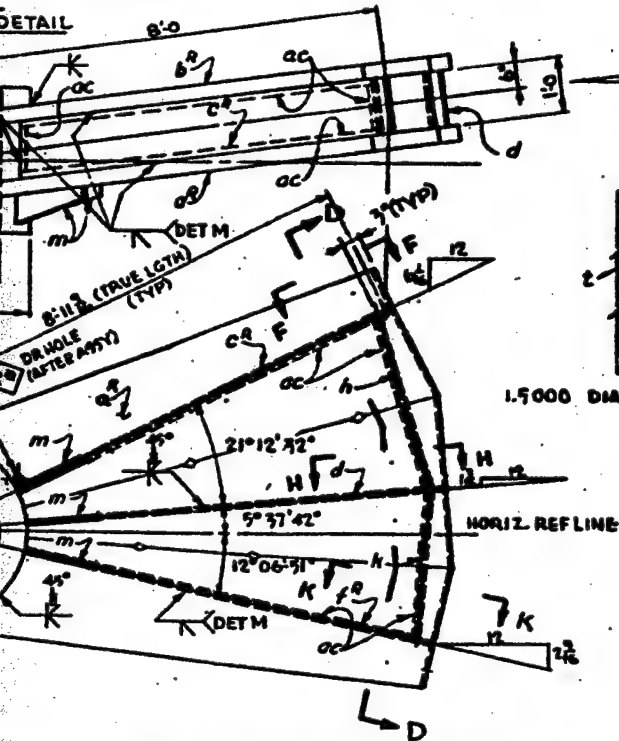
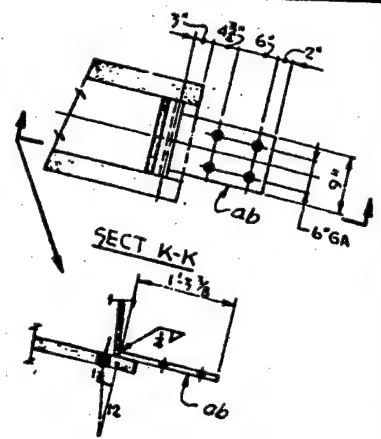
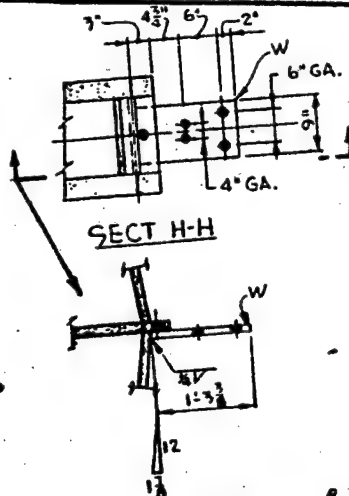
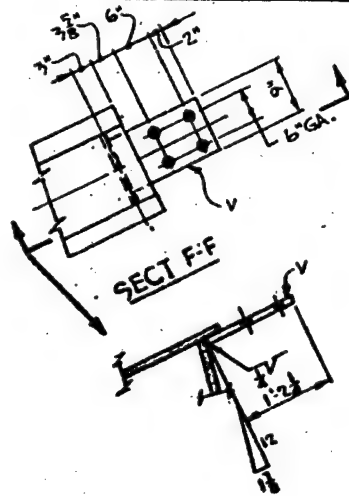
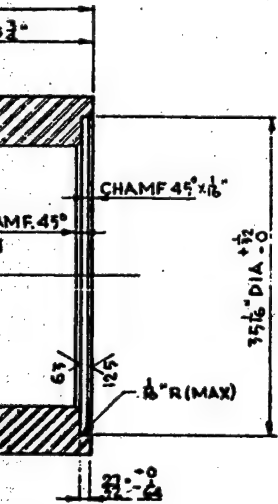
DETAIL B  
 WELDMENT ASSY

STRESS RELIEVE AFTER ALL  
 WELDING HAS BEEN COMPLETED

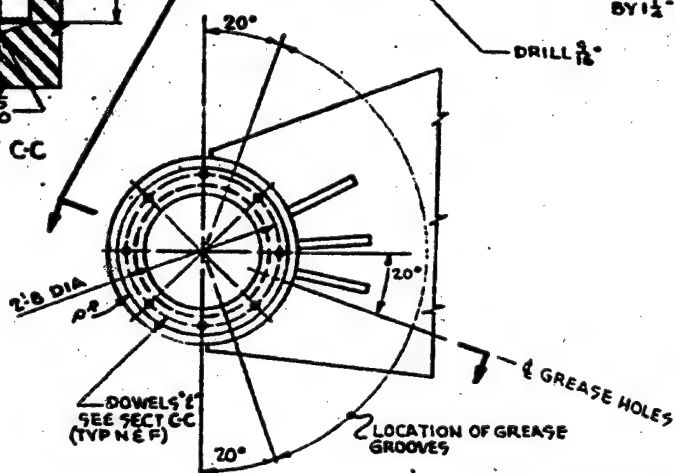
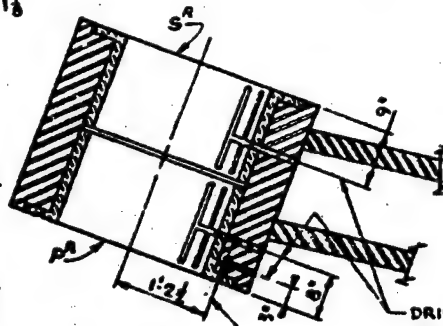
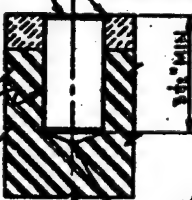
8/8 AS SHOWN  
 OPP HAND

NOTE  
 SEE  
 TO F  
 REI

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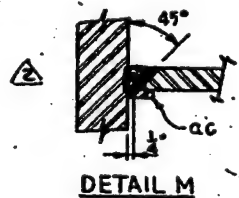


HEAD OF DOWEL 1/4" MIN  
BELOW BRG SURFACE  
C9K 45° x 1/8"



NOTE: ERECTION CLIPS NOT SHOWN;  
SEE SECT F-F, H-H, & K-K. CLIPS  
TO BE REMOVED TO COMPLETE  
REQUIRED FIELD WELD.

AS SHOWN  
OPP HAND



8 MK 39A<sup>R</sup> AS SHOWN TRUNNION  
8 MK 39A<sup>L</sup> OPP HAND HUB ASSY  
SEE DET B FOR WELDMENT  
ASSY

WORK THIS SHEET WITH N240

CONTRACT NO DA45-164 CIVENG 65-260

APPROVED

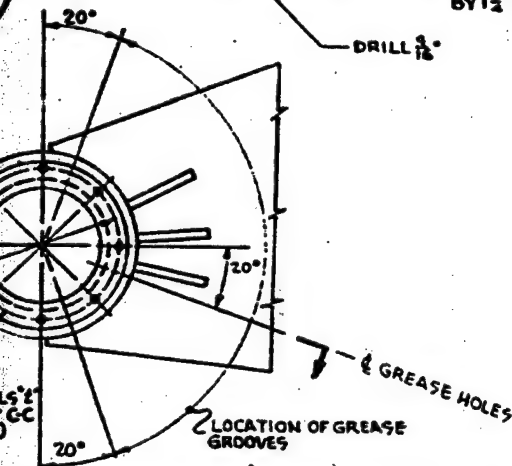
Subject to conformity with plans and specifications,  
correction of errors or omissions, and to liability on  
of any required tests. Approved does not cover design  
omissions, or responsibility for assembling and  
finishing.

OFFICE OF RESIDENT ENGINEER  
LITTLE ROCK LOCK AND DAM

1400

Date: 31 Oct 67

(2)



**MATERIAL SPECS:**  
**PLATE & BAR**      **ASTM-A36**  
**HUB FORGING**      **ASTM-A235, CL. CI 9025-1030**  
**BUSHING**      **ALUMINUM BRZ ASTM-B148**  
                          **CL. 9-C HT.**  
**DOWEL**      **COM'L COLD FIN. ST. (C1018)**  
**MACH BOLTS**      **ASTMA307 GRA**

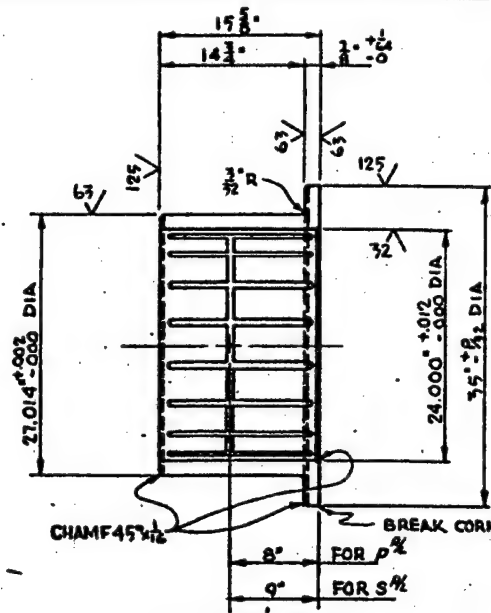
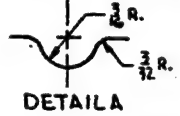
REFERENCE:  
CORPS OF ENGRD WNG NO LGD-1-5-8/5, SHT 89, VOL 1, REV B  
SPEC9: PG TP-16-1, SECT 16

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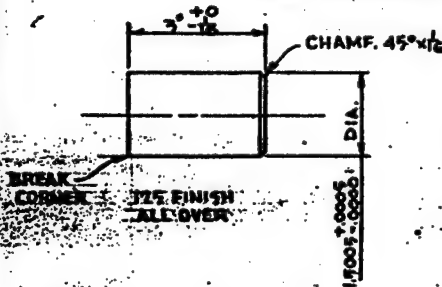
LIG-65-360-1017013

REVISED  
TO SUIT  
CONS 44  
10-3-66  
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LW



**SECTION B-B**

- |                                      |        |                           |
|--------------------------------------|--------|---------------------------|
| S79 <sup>R</sup> AS SHOWN            | MAKE 8 | } TRUNK<br>MACH 1<br>MATC |
| S79 <sup>L</sup> OPP HAND            | MAKE 8 |                           |
| P79 <sup>R</sup> AS NOTED            | MAKE 8 |                           |
| P79 <sup>L</sup> AS NOTED & OPP HAND | MAKE 8 |                           |

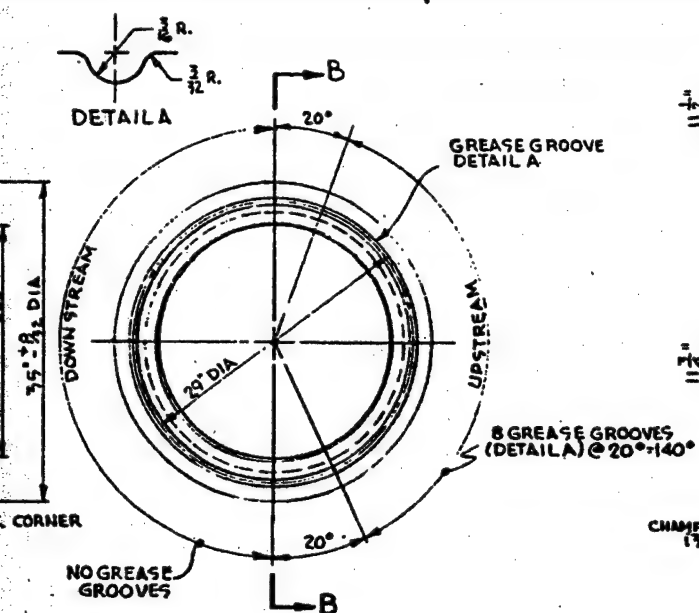


2<sup>ND</sup> DOWEL PIN 1 3/8 DIA x 0.3 MAKE 256



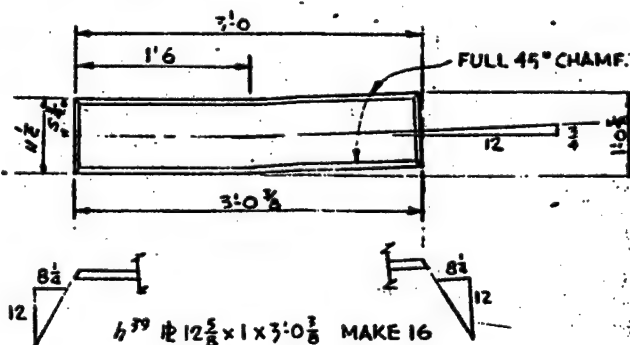
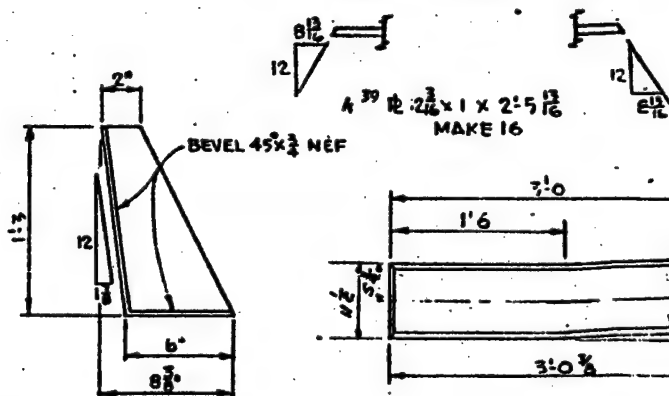
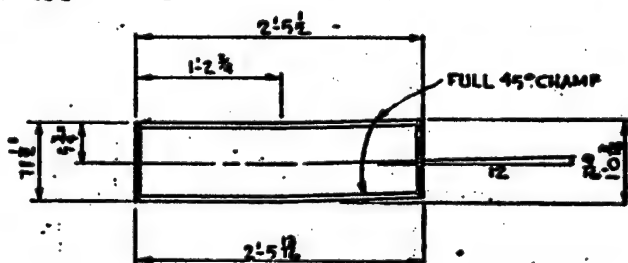
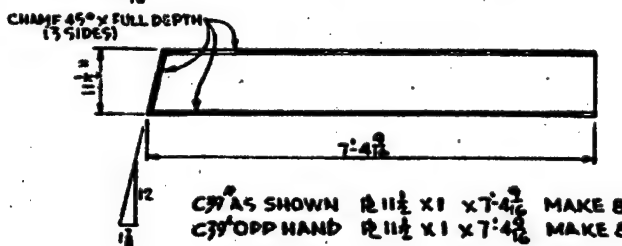
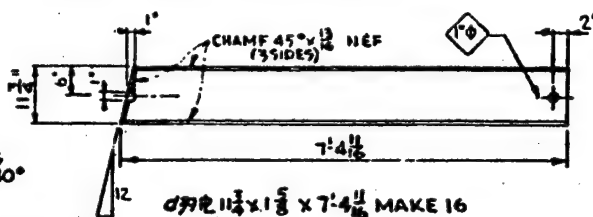
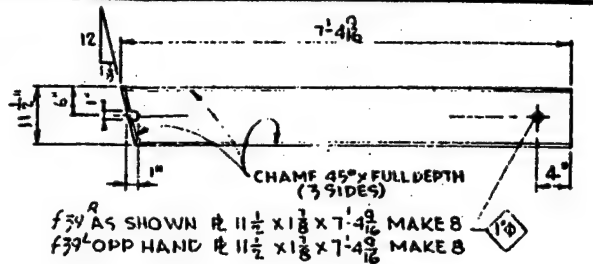
m79 8

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MAKE 8  
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MAKE 8

TRUNNION BUSHING  
MACHINE IN PAIRS (S<sup>OP</sup> & P<sup>OP</sup>) (S<sup>OP</sup> & P<sup>OP</sup>)  
MATCH MARK H<sup>OP</sup> THRU 8



**AS BUILT**

CONTRACT NO DA45-164 CIVENG 65-560

**APPROVED**

Subject to conformity with plans and specifications,  
correction of errors or omissions, and to fulfillment  
of any required tests. Approved upon the error detail  
drawings, or assembly for mounting and  
testing.

OFFICE OF RESIDENT ENGINEER  
LITTLE ROCK LOCK AND DAM

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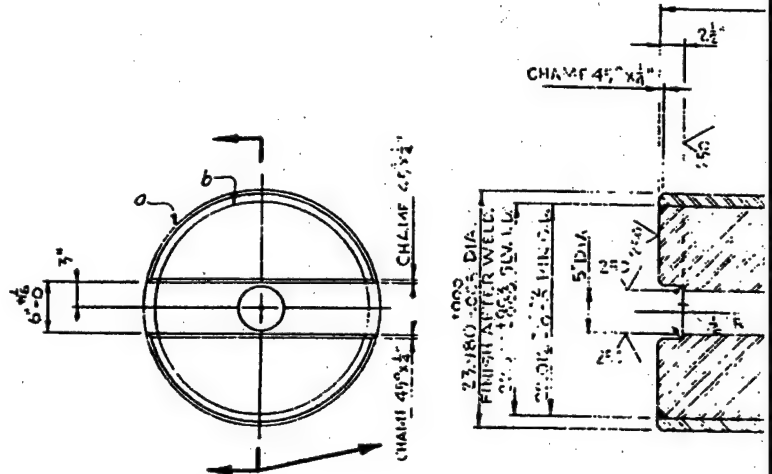
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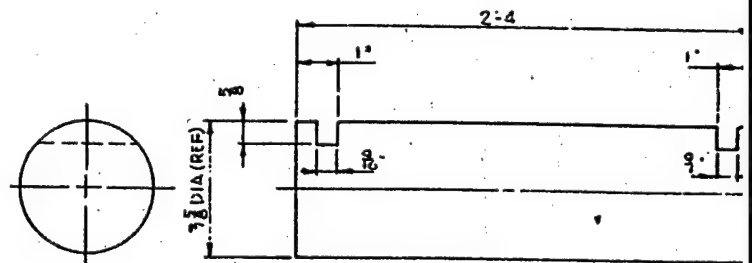


REVISIONS  
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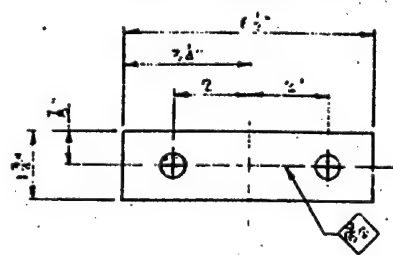
Δ CORRECTED  
 MAT'L SPEC  
 FOR ST. STL  
 SLEEVE  
 P. 10-1-66  
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**16 MK 41A** TRUNNION



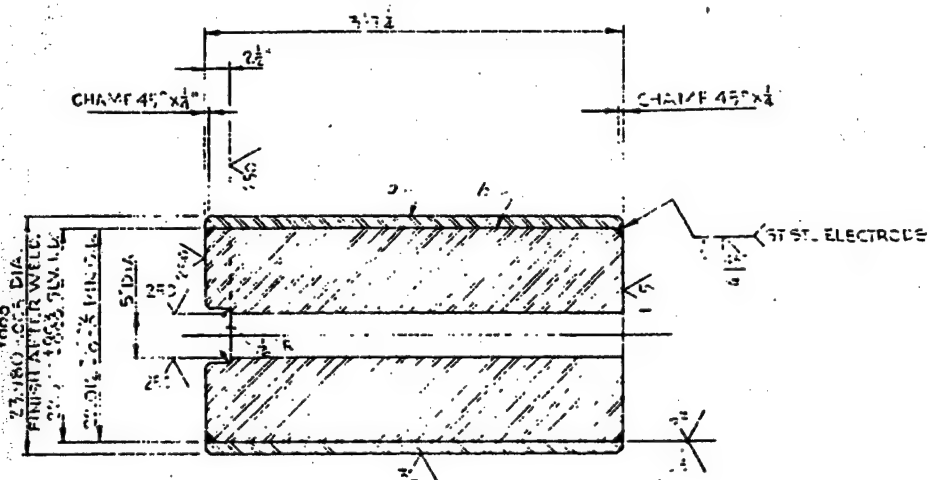
**16 MK 41B** LIFTING PIN BAR 3/4 x 1/2



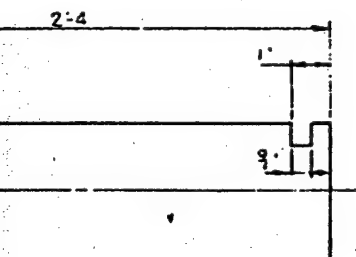
**32 MK 41C** KEEPER BAR BAR 1 3/4 x 1/2

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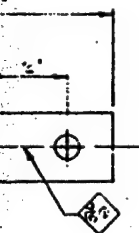




**16 MK 41A** TRUNNION PIN



**B** LIFTING PIN BAR 3 1/2 X 2 1/4



**C** KEEPER BAR BAR 1 1/2 X 6 1/2

**AS BUILT**  
CONTRACT NO. DAAG-164 CIVENG-655

**APPROVED  
AS CORRECTED**

Subject to correction with plans and specifications.  
Correction of errors and omissions in fulfillment  
of contract. All work shall be done in accordance  
with the contract and the specifications and  
standards.

OFFICE OF RESIDENT ENGINEER  
LITTLE ROCK LOCK AND DAM

*[Signature]*

Date: 10 Dec 66

(2)

34

FORGING ASTM A237 CL.C  
ST STL(LIFTING)ASTM A276 TYPE 410 COND.T  
ST STL(KEEPER BAR)ASTMA276 TYPE 303 CONDA.

△ △  
△

CORPS OF ENGR DWG NO LGD 1-5-8/2 SHT 86 VOL 1 REV B  
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 1-5-8/3 87 B  
 1-5-8/5 88 A  
 SPEC9 PG TP 16-1, SECT 16

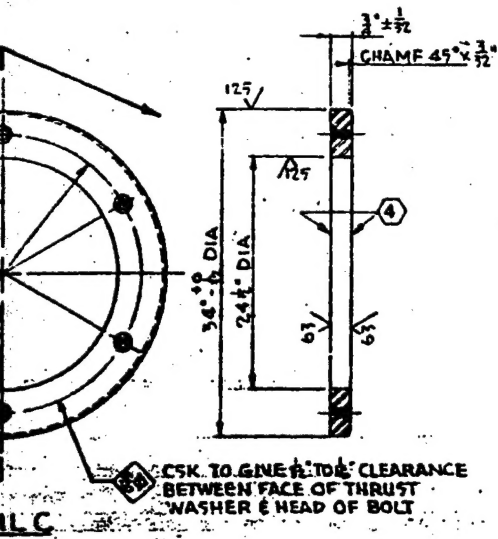
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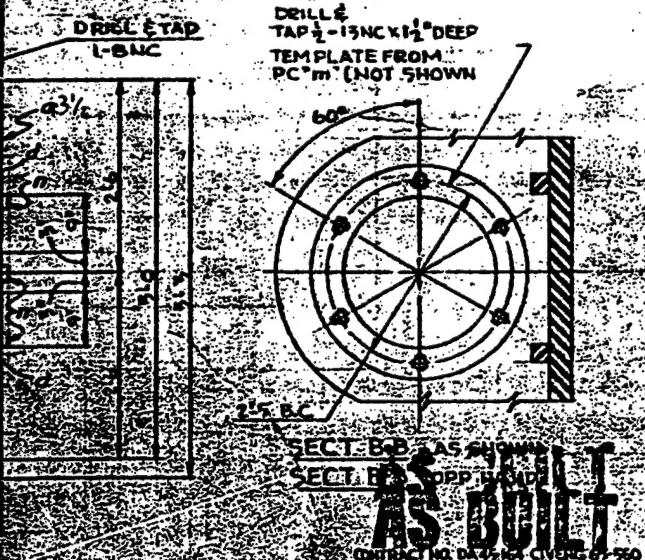






BILL OF MATERIAL									
ITEM NO	QTY	UNIT	DESCRIPTION	LENGTH		REMARKS	WEIGHT		
				IN	FR				
8	47A	16	d 2 1/2 x 1/2	5	0		42.241		
8	47A	16	d 2 1/2 x 1/2	5	0	(1)	13.440		
		16	C 1/8 x 3	3	1/2		10.315		
		32	d 1/8 x 3	2	1/2		26.73		
		64	f 1/8 x 3	0	9		2.335		
		16	K 1/8 x 3	2	6		1.554		
		32	m 1/8 x 3	2	10	UPPER	9.541		
		48	n 1/8 x 3	3	0		9.79		
			SHOP WELD				73.05		
		192	1/2 F.H. CAP SCREW	0	2	HEEL	28		
						17 1/2			
16	47B		1/8 x 3	3	2		25.87		
SHIP									
33			1" M.B. 4" THICK	0	6	1" M.B. 4" THICK	6NC		
33			1" M.B. 4" THICK	0	9	1" M.B. 4" THICK	6NC		
33			2" M.B.	0	9	2" M.B.	4NC		
17			2" M.B.	0	8	2" M.B.	4NC		
17			1" M.B.	0	8	1" M.B.	6NC		
33			2" M.B.	0	6	2" M.B.	4NC		
Total					174.240				

MATERIAL SPEC:  
 PLATE & BAR ASTM A36 EXCEPT AS NOTED  
 PLATE, ST. 51L QQ-5766B TYPE 304 COND A  
 BOLTS, HIGH STRENGTH STL ASTM A328, GRBB

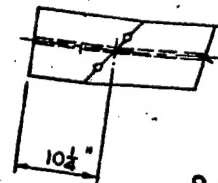
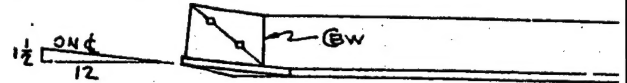
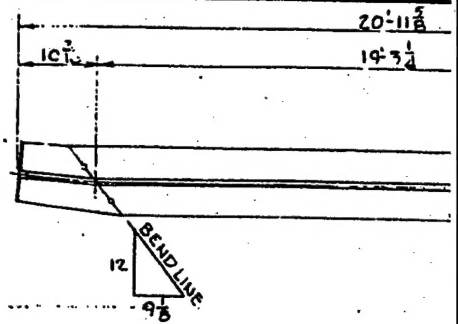


NOTES  
 ① WELD AFTER MACHING HAS BEEN COMPLETED  
 ② WELD AT FINAL SHOP ASSEMBLY WITH TRUNNION PIN KEYS: BAR IN PLACE. SHEAR BARS ARE TO BEAR FIRMLY AGAINST KEYS.  
 ③ THESE SURFACES TO BE FLAT AND PARALLEL WITHIN .001\"/>

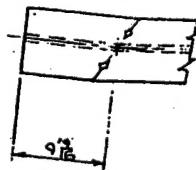
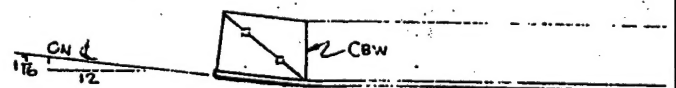
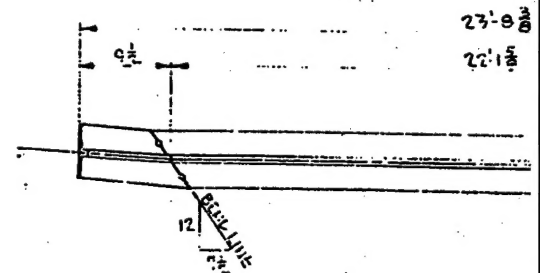
PREPARED BY CHECKED BY DESIGNED BY DRAWN BY DATE	REQ'D BY DATE NO. SHOP PART
PACIFIC CAR AND FOUNDRY COMPANY 1000 1st Ave. S.W. SEATTLE, WASHINGTON 98108	
LITTLE GOOSE LOCKE DAM ITEM 101 - 500 L.W. GATE VINNELL, MANNING, FORTER, DILLINGHAM CIVIL ENGINEERS 1000 1st Ave. S.W. SEATTLE, WASHINGTON 98108	
TRUNNION YONE ASS'Y DETAIL 101-016	

**APPROVED**  
 Checked by \_\_\_\_\_  
 Date \_\_\_\_\_  
 OFFICE OF GENERAL ENGINEER  
 LITTLE GOOSE LOCKE DAM

REVISIONS  
 DELETED HOLES PER  
 DWG E31  
 10-1-66 C.A.H. *car*

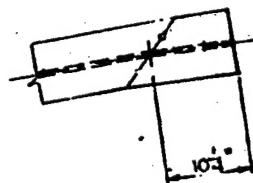
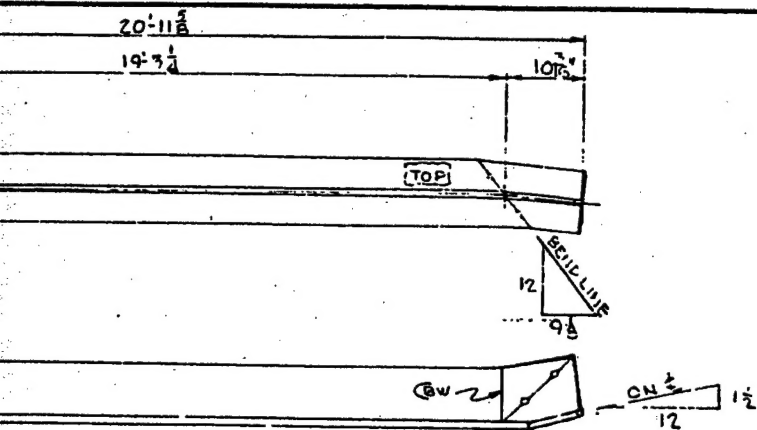


8 MK 43A<sup>R</sup> AS SHOWN  
 8 MK 43A<sup>L</sup> OPP HAND



8 MK 43B<sup>R</sup> AS SHOWN  
 8 MK 43B<sup>L</sup> OPP HAND

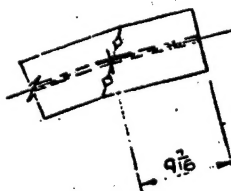
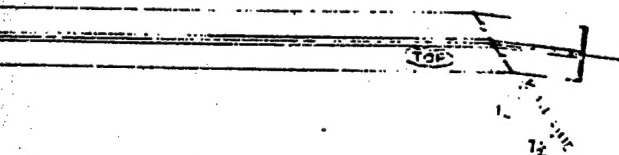
①



**3A<sup>R</sup>** AS SHOWN  
**3A<sup>L</sup>** OPP HAND ST7WF15 x 20'-11 3/4"

23'-9 3/8"  
 22'-1 5/8"

9 3/4"



**43B<sup>R</sup>** AS SHOWN  
**43B<sup>L</sup>** OPP HAND ST7WF15 x 23'-9 3/8"

**AS BUILT**

CONTRACT NO DA 45-164 CVENG 65-560

**APPROVED**

Subject to conformity with plans and specifications, correction of errors or omissions, and to fulfillment of any required tests. Approval does not cover detail dimensions or accountability for assembling and fastening.

OFFICE OF RESIDENT ENGINEER  
 LITTLE GOOSE LOCK AND DAM

--- HRS ---

Date: 28 Oct 66

2



total	10,728
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REFERENCE:  
CORPS OF ENGR DWG NO LCDI-5-8/3 SHT 87 VOL I REV B  
SPEC5: PAGE TR16-1, SECT 16

CONTRACT NO DA45164 CIVENG 65-560

Subject to conformity with plans and specifications, correction of errors or omissions, and to fulfillment of any required tests. Approval does not cover detail dimensions, or accountability for assembling and fastening.

OFFICE OF RESIDENT ENGINEER  
LITTLE GOOSE LOCK AND DAM

Div. 38 Oct 66

**Heat Field Data**

M.A. \_\_\_\_\_  
S.F. \_\_\_\_\_ OPEN HOLES \_\_\_\_\_ EXCEPT AS NOTED  
S.F. \_\_\_\_\_ END AND EDGE DISTANCE \_\_\_\_\_ EXCEPT AS NOTED  
E \_\_\_\_\_ SPACING NOT SHOWN \_\_\_\_\_  
M.A. \_\_\_\_\_ PAINT \_\_\_\_\_ NO SHOP PAINT \_\_\_\_\_  
S.F. \_\_\_\_\_  
S.F. \_\_\_\_\_  
**Heat Loss Data**  
S.F. \_\_\_\_\_  
S.F. \_\_\_\_\_  
**Heat Value**

**CERT. WELDED REQ. INSPECTION CERTS. OF ENGE.**

**PACIFIC CAR AND FOUNDRY COMPANY**  
80 S. HUDSON ST. P.O. BOX 698  
SEATTLE, WASHINGTON 98134

LITTLE GOOSE LOCK & DAM  
ITEM#101- SPILLWAY GATE  
WINNELL MANNING FULLER DILLINGHAM  
CAHILL ~~and~~ ~~FULLER~~ CO. INC. DATE 5-7-66  
REVISIONS \_\_\_\_\_ CHECKED BY \_\_\_\_\_  
F.L. J. JORDAN BRACING  
J. J. MILLAR DETAIL C670-16101  
ALLEN L. STEWART APPROVED DATE Feb.  
✓ 2/19/66 R.O. Knudsen 43 1/2  
Drawn By \_\_\_\_\_ Date \_\_\_\_\_

LTC-4-760-101-017 398

**MAR 19 1980**